This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
O123 .C38b 1868 STOR
A theoretical and practical treatise on
24503344806

LANE
MEDICAL LIBRARY
SEAL OF THE LELAND STANFORD JUNIOR UNIVERSITY
SEMPER VIRENS
1885
LEVI COOPER LANE FUND

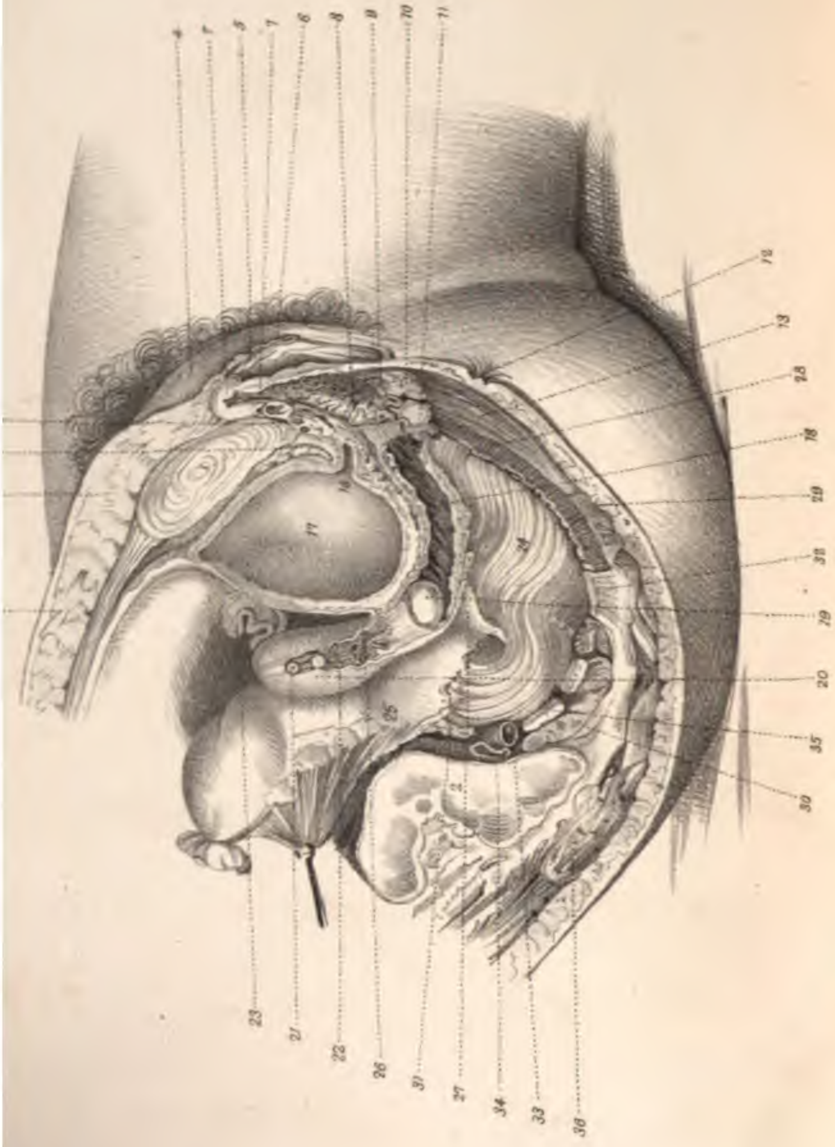
H.H. Bancroft & C
Importers and Dealers i
Medical Books
and Publishers of the
PACIFIC
Medical and Surgical

PRESENTED TO
LIBRARY OF
COOPER MEDICAL COLLEGE,
By Dr. Henry Gibbons, Jr.

This book is the property of
COOPER MEDICAL COLLEGE,
SAN FRANCISCO, CAL.
and is not to be removed from the Library Room by any person or under any pretext whatever.

A
THEORETICAL AND PRACTICAL TREATISE
ON
MIDWIFERY.

Pl. I.



T. Sinclair's Lith.

A

THEORETICAL AND PRACTICAL TREATISE

ON

MIDWIFERY,

LANE LIBRARY

INCLUDING THE

DISEASES OF PREGNANCY AND PARTURITION.

BY

P. CAZEAUX,

Member of the Imperial Academy of Medicine; Adjunct Professor in the Faculty of Medicine of Paris; Chevalier of the Legion of Honor; Correspondent of the Society of Accoucheurs of Berlin; President of the Medical Society of the Department of the Seine, etc., etc.

ADOPTED BY THE SUPERIOR COUNCIL OF PUBLIC INSTRUCTION,

AND PLACED, BY MINISTERIAL DECISION, IN THE RANK OF THE CLASSICAL WORKS DESIGNED FOR THE USE OF MIDWIFE STUDENTS, IN THE MATERNITY HOSPITAL OF PARIS.

REVISED AND ANNOTATED

BY

S. TARNIER,

Adjunct Professor in the Faculty of Medicine of Paris; Hospital Surgeon; Former Clinical Chief of the Lying-in Hospital; Member of the Surgical Society, and of the Anatomical Society.

Fifth American from the Seventh French Edition,

BY

WM. R. BULLOCK, M.D.

LANE MEDICAL LIBRARY
759
SAN FRANCISCO

With One Hundred and Seventy-five Illustrations.

PHILADELPHIA.
LINDSAY AND BLAKISTON.
1868.

Entered according to Act of Congress, in the year 1868, by
LINDSAY AND BLAKISTON,
in the Clerk's Office of the District Court of the United States, in and for the Eastern District of Pennsylvania.

SHERMAN & CO., PRINTERS.

38k
1868

NOTE BY THE TRANSLATOR.

THE translation of the seventh and last French edition of *Cazeaux's Midwifery* is now offered to the Profession.

Since the death of Prof. Cazeaux the work has been revised and edited by Prof. Tarnier, in whose preface will be found indicated the many and important alterations and additions which it has undergone.

The copious index accompanying the present American edition will, it is hoped, be found of practical utility.

W. R. BULLOCK.

WILMINGTON, DEL.,
May 18, 1868.

This book is the property of
COOPER MEDICAL COLLEGE,
SAN FRANCISCO, CAL.
and is not to be removed from the
Library Room by any person or
under any pretext whatever.

PREFACE TO THE SEVENTH EDITION.

THE sixth edition of this work was almost exhausted, when its author, in the full strength of years and talent, was suddenly struck down by the disease which very soon proved fatal. In departing, Cazeaux left a name beloved of physicians and students, and respected by all. The success of his work on obstetrics had greatly contributed to extend his reputation and scientific authority. Inasmuch, therefore, as the stoppage of its publication would deprive the medical public of a work which, for a long time, has justly been ranked first amongst classical books, both Cazeaux's family and his editor concurred in the opinion that a new edition ought to be published.

A classical book soon grows old in these days, and it was found impossible to bring out a new edition without subjecting it to the alterations demanded by the progress of science. I was charged with its preparation, and accepted the honor of the task with a full appreciation of its difficulties. I had never been Cazeaux's pupil, but his book was the first from which I had studied obstetrics, and I had been accustomed to see it in the hands of all my fellow-students, and, at a later period, of my pupils also. Independently, therefore, of my personal observation, I was in a position to become acquainted with its character through others. Thus, together with merited praise, I sometimes also listened to criticisms of its details, and profited by all I heard.

I was left at liberty to remodel the work according to my judgment, to make the alterations which seemed to be required, to suppress some passages and to introduce new ones. Out of respect to Cazeaux's memory, it was decided that the printing should be done in two kinds of type; the larger for the old text, and the smaller for what I had myself written.

The reader will readily distinguish what belongs to Cazeaux and what to myself, but the work has been resolved into a homogeneous body without contradictory annotations. This last result could not possibly have been attained without retouching the old text, by which a new direction and meaning has been sometimes given to the original ideas. Should it be desired to know certainly what Cazeaux's opinions were, it will, therefore, be necessary to consult an old edition.

Especially have I made it a duty not to change the spirit in which the work had been conceived; therefore I can say with Cazeaux, that, "After a work has passed through several editions, a preface is hardly needed, for its object is then sufficiently well known. The present is more particularly intended for the use of students of medicine and midwife-students, although general practitioners may also, perhaps, gain something by its perusal, for I have endeavored to make it a condensed summary of the leading principles established by the masters of our art, and for that purpose have drawn from all the works published down to the present day. My position in the lying-in hospitals has enabled me to test the value of the doctrines put forth by former authors; and I have adopted as true all which my daily experience has confirmed, and have rejected unhesitatingly, from whatever source they came, all such as were disproved by the numerous cases brought under my observation, confining myself to quoting, without comment, those whose value I have been unable to determine.

"Although this work resembles, in its general arrangement, most of those published on the same subject in France, it differs from them essentially in the main; for I have adopted almost wholly the views of Professors Nægèle, P. Dubois, and Stoltz, which are not found clearly expressed in any of our classical books. I have also extracted freely from the learned treatise of Professor Velpeau, whose vast erudition has greatly facilitated my bibliographical researches; from the course of my former teacher, Professor Moreau; from the excellent articles of Désormeaux, of Dugès, and of Guillemot; from the classical works of England and America, such as those of Burns, Campbell, Merriman, Ramsbotham, Dewees, Meigs, and Rigby; and from the treatises of Peu, Delamotte, Levret, Smellie, Baudelocque, Gardien, and Capuron. I have also consulted with advantage the manual recently published by my friend, Dr. Jacquemier; also, the memoirs of Simpson, Tyler Smith, Depaul, Devilliers, &c. I may be permitted also to express publicly my thanks to M. Coste, for his great kindness in allowing me to study his beautiful collection in the College of France, and to borrow several figures from the magnificent work which he is now publishing. Lastly, it will be seen how highly I value the eminently practical writings of Madame Lachapelle. In a word, I have selected from all sources whatever bears the impress of truth. In the sciences of observation, a new work is necessarily enriched by the labors of all antecedent writers; and therefore, its greatest merit consists in collecting its scattered materials, and forming out of them a body of doctrine, which it illustrates in the clearest and simplest manner possible. Such is the end I have endeavored to attain; and the medical public, and students especially, must judge whether I have succeeded in the attempt.

"But few quotations have been made, though their number might have been greatly increased; but I wished to avoid the charge made by most students against one of our best classical works. However, I have felt bound to refer to living authors whenever I have introduced a new theory, or any particular procedure, which emanated from them; and besides, as the professorate may be deemed a mode of publicity, I have respected the right to the original ideas which I have heard emitted by Professor Dubois; and his name will be found scrupulously associated with all the opinions emanating from him.

"Notwithstanding a spurious copy published in Belgium, and several translations into foreign languages, the large editions of the work first published were rapidly exhausted. So favorable a reception made it obligatory upon me to neglect nothing which could render this edition worthy of the reputation of its predecessors. I have, therefore, reviewed and corrected all parts of it with scrupulous care."

The plan of the present edition has been so greatly modified that it may be regarded as altogether new, the order followed being that which I long since adopted for my course of lectures, as the most natural and the best. The chapters are grouped into eight principal parts. Part first is devoted to the female organs of generation. The pelvis is first studied by describing separately each of its component parts, afterwards considering them as a whole, and pointing out carefully whatever peculiarities it may present as to form, direction, and size; then we pass immediately to the anatomical description of the external and internal organs of generation. It will be seen that I have here profited by M. Sappey's recent researches in regard to the structure of the ovary, and those of Dr. Helie (of Nantes) in regard to the structure of the uterus. The physiology of the genital organs is now so intimately connected with their anatomical arrangement that it is impossible to describe them fully without speaking at the same time of their functions. The phenomena which they exhibit at certain periods are also very properly regarded as the preludes of generation, making their preliminary study indispensable to all who would understand the changes which these organs undergo during the puerperal condition.

The genital apparatus of the female having been studied in the non-pregnant condition, we examine, in the second part, those very numerous and important changes which they undergo during gestation, and shall often have occasion to quote the many works of Robin on the uterine mucous membrane, the decidua, and the placenta. We afterwards study the first cause of all of these changes, to wit, the fœtus and its appendages, which are traced through the various stages of their development. From this examination we deduce the signs of pregnancy.

Having acquired these preliminary notions, we are in a condition to enter upon the subject of labor in the third part of the work. In the process of parturition we distinguish two orders of phenomena: one purely physiological and expressive of the vital action called into play in order to expel the fœtus; the others, purely mechanical, and constituting the mechanism by which this expulsion takes place.

We have given great latitude to the description, and especially to the explanation of the mechanism of natural labor, and think that we have succeeded in explaining certain facts which, hitherto, had only been pointed out. New views have also led us to describe six principal stages in the mechanism of all the presentations. After the labor, properly so called, comes the study of the delivery of the after-birth, and of the puerperal state; this part including afterward the subject of the attentions to be given to the woman during and after labor, as also an article devoted to apparent death of new-born children.

I have also greatly extended the pathology of pregnancy, to which the entire fourth part is devoted. Chapters entirely new will be found in it on the diseases of pregnancy, the alterations to which the placenta is subject, and the death of the child during intra-uterine life. Thus, I hope that I have supplied an omission that was to be regretted.

In the fifth part, which is devoted to difficult labor, we treat in detail of deformities of the pelvis and all other causes of dystocia, the way in which each operates, their situation in the mother, the child or its appendages, the signs whereby their presence may be detected, the indications which they present, and the means of remedying them. In the study of the accidents which are liable to complicate labor, I have profited by all the works published of late years, and in the account of hemorrhage, puerperal convulsions, and the indications which they present, will be found some new considerations. To fill up properly the outline which we had traced, it became necessary to treat carefully of artificial delivery of the after-birth, and the accidents to which it is liable.

I have introduced a sixth part, devoted to obstetrical therapeutics, which includes two chapters only: the first being devoted to ergot, and the second to the effect of a debilitating regimen and a certain course of medication upon the development of the child during intra-uterine life.

The seventh part comprises a discussion of the use of anæsthetics in labor, an account of the use of the tampon and of all the obstetrical operations, rendered in a degree of detail proportioned to the interest which attaches to them.

The eighth and last part, is exclusively devoted to the hygiene of the child from birth to the period of weaning.

It would be impossible to point out all the additions which are scattered through the work, but they are very many. Everywhere have I accorded to the views of Professors Depaul and Pajot, as also to the views of all contemporaneous authors, the prominence which they deserve. I hope therefore that this book, which is, so to speak, a new one, will be found to represent all the most important knowledge which we possess pertaining to the obstetric art.

TARNIER.

indispensable to all who would understand the changes which these organs undergo during the puerperal condition.

The genital apparatus of the female having been studied in the non-pregnant condition, we examine, in the second part, those very numerous and important changes which they undergo during gestation, and shall often have occasion to quote the many works of Robin on the uterine mucous membrane, the decidua, and the placenta. We afterwards study the first cause of all of these changes, to wit, the fœtus and its appendages, which are traced through the various stages of their development. From this examination we deduce the signs of pregnancy.

Having acquired these preliminary notions, we are in a condition to enter upon the subject of labor in the third part of the work. In the process of parturition we distinguish two orders of phenomena: one purely physiological and expressive of the vital action called into play in order to expel the fœtus; the others, purely mechanical, and constituting the mechanism by which this expulsion takes place.

We have given great latitude to the description, and especially to the explanation of the mechanism of natural labor, and think that we have succeeded in explaining certain facts which, hitherto, had only been pointed out. New views have also led us to describe six principal stages in the mechanism of all the presentations. After the labor, properly so called, comes the study of the delivery of the after-birth, and of the puerperal state; this part including afterward the subject of the attentions to be given to the woman during and after labor, as also an article devoted to apparent death of new-born children.

I have also greatly extended the pathology of pregnancy, to which the entire fourth part is devoted. Chapters entirely new will be found in it on the diseases of pregnancy, the alterations to which the placenta is subject, and the death of the child during intra-uterine life. Thus, I hope that I have supplied an omission that was to be regretted.

In the fifth part, which is devoted to difficult labor, we treat in detail of deformities of the pelvis and all other causes of dystocia, the way in which each operates, their situation in the mother, the child or its appendages, the signs whereby their presence may be detected, the indications which they present, and the means of remedying them. In the study of the accidents which are liable to complicate labor, I have profited by all the works published of late years, and in the account of hemorrhage, puerperal convulsions, and the indications which they present, will be found some new considerations. To fill up properly the outline which we had traced, it became necessary to treat carefully of artificial delivery of the after-birth, and the accidents to which it is liable.

I have introduced a sixth part, devoted to obstetrical therapeutics, which includes two chapters only: the first being devoted to ergot, and the second to the effect of a debilitating regimen and a certain course of medication upon the development of the child during intra-uterine life.

The seventh part comprises a discussion of the use of anæsthetics in labor, an account of the use of the tampon and of all the obstetrical operations, rendered in a degree of detail proportioned to the interest which attaches to them.

The eighth and last part, is exclusively devoted to the hygiene of the child from birth to the period of weaning.

It would be impossible to point out all the additions which are scattered through the work, but they are very many. Everywhere have I accorded to the views of Professors Depaul and Pajot, as also to the views of all contemporaneous authors, the prominence which they deserve. I hope therefore that this book, which is, so to speak, a new one, will be found to represent all the most important knowledge which we possess pertaining to the obstetric art.

TARNIER.

TABLE OF CONTENTS.

PART I.

OF THE FEMALE ORGANS OF GENERATION.

PAGE
CHAPTER I.—Of the Pelvis, ... 33
Article I.—Of the Bones of the Pelvis, ... 34
§ 1. The Sacrum, ... 34
§ 2. Coccyx, ... 36
§ 3. Coxal Bones, or Ossa Innominata, ... 37
Article II.—Articulations of the Pelvis, ... 39
§ 1. Articulation of the Pubis, ... 40
§ 2. Sacro-Iliac Articulations, ... 41
§ 3. Sacro-Coccygeal Articulation, ... 42
§ 4. Sacro-Vertebral Symphysis, ... 43
§ 5. Sub-Pubic Membrane, ... 44
Article III.—Of the Pelvis in general, ... 44
§ 1. External Surface, ... 44
§ 2. Internal Surface, ... 44
§ 3. Superior Strait, ... 47
§ 4. Inferior Strait, ... 49
§ 5. Cavity of the Pelvis, ... 51
§ 6. Base of the Pelvis, ... 53
§ 7. Differences of the Pelvis, ... 53
§ 8. Uses of the Pelvis, ... 54
Article IV.—Of the Pelvis covered by the Soft Parts, . . . 54

CHAPTER II.—Of the External Organs of Generation, . . . 57
Article I.—The Mons Veneris, ... 58
Article II.—The Vulva, ... 58
Labia Majora, ... 58
Labia Minora, ... 59

PAGE

Clitoris, ... 60
Vestibule, ... 61
Urethra, ... 61
Hymen, ... 62
Carunculæ Myrtiformes, ... 63
Fossa Navicularis, ... 63

ARTICLE III. — Secretory Apparatus of the External Genital Organs, . 64
Sudoriparous Glands, ... 64
Sebaceous Glands, ... 64
Mucous Glands, ... 64
Vulvo-Vaginal Gland, ... 65

ARTICLE IV. — The Perineum, ... 67

CHAPTER III. — INTERNAL ORGANS OF GENERATION, ... 68

ARTICLE I. — The Vagina, ... 68

ARTICLE II. — The Uterus, ... 71
§ 1. External Surface of the Uterus, ... 73
Body of the Uterus, ... 73
Neck of the Uterus, ... 74
§ 2. Internal Surface of the Uterus, ... 76
Cavity of the Body, ... 76
Cavity of the Neck, ... 77
§ 3. Structure of the Uterus, ... 78
Peculiar Tissue, ... 78
Peritoneal Membrane, ... 78
Mucous Membrane, ... 79
§ 4. Ligaments of the Uterus, ... 82
Broad Ligaments, ... 82
Bodies of Rosenmüller, ... 82
Round Ligaments, ... 84

ARTICLE III. — The Fallopian Tubes, ... 85

ARTICLE IV. — The Ovaries, ... 86
§ 1. Structure of the Ovaries, ... 88
§ 2. Ovarian Vesicles, ... [illegible]
§ 3. Human Ovule, ... [illegible]

CHAPTER IV. — OVULATION AND MENSTRUATION, ... [illegible]

ARTICLE I. — Modifications of the Ovarian Vesicles, ... [illegible]
The Corpus Luteum, ... [illegible]

ARTICLE II. — Menstruation, ... [illegible]

CHAPTER V. — THE BREASTS, ... [illegible]

PART II.

OF PREGNANCY.

PAGE

CHAPTER I.—Conception, ... 119

CHAPTER II.—Changes in the Maternal Organism, ... 125

Article I.—Changes in the Uterus, ... 125
§ 1. Changes in the Body of the Uterus, ... 125
§ 2. Changes in the Neck, ... 130
§ 3. Changes of Structure, ... 136
1. Serous Layer, ... 136
2. Mucous Layer, ... 137
3. Middle Layer, ... 137
A. Mad. Boivin's Structure, ... 138
B. Deville's Structure, ... 139
C. M. Hélie's Structure, ... 142
4. Vascular Apparatus, ... 145

Article II.—Properties of the Uterus (Changes of), ... 148
Sensibility of the Uterus, ... 148
Irritability, ... 148
Contractility, ... 149
Retractility, ... 151

Article III.—Changes in the Parts adjacent to the Uterus, . . 152

Article IV.—Changes in the Breasts, ... 155

Article V.—Anatomical and Functional Changes in some Parts not concerned in Generation, ... 156
§ 1. Digestion, ... 157
§ 2. Circulation, ... 157
§ 3. Urine, ... 160
Kyesteine, ... 161
§ 4. Osteophytes of the Cranial Bones, ... 166
§ 5. Pigmentary Deposits, ... 166

CHAPTER III.—Of the Decidua, ... 167
Old Theory, ... 167
Present Theory, ... 171

CHAPTER IV.—Of the Human Ovum after Fecundation, . . . 179

Article I.—Changes which the Ovule undergoes in the Fallopian Tube, 180
Disappearance of the Germinal Vesicle, ... 180

PAGE
Condensation of the Vitellus, ... 180
Polar Globules, ... 180
Vitelline Nucleus and Segmentation of the Vitellus, . . 181

Article II.—Changes undergone by the Ovule from the time of its Arrival in the Womb to the Formation of the Allantoid, . . 182

Article III.—Of the Fœtal Appendages, ... 187
§ 1. The Allantoid Vesicle, ... 187
§ 2. Umbilical Vesicle, ... 188
§ 3. The Amnion, ... 190
§ 4. Waters of the Amnion, (Liquor Amnii), ... 191
§ 5. Chorion, ... 192

Article IV.—Organs of Connection, ... 194
§ 1. Placenta, ... 194
§ 2. Umbilical Cord, ... 207

CHAPTER V.—Of the Fœtus, ... 210

Article I.—The Fœtus during Intra-Uterine Life, ... 211

Article II.—Head of the Fœtus at Term, ... 217

Article III.—Position and Attitude of the Fœtus, ... 222

Article IV.—Functions of the Fœtus, ... 225
§ 1. Nutrition, ... 225
§ 2. Respiration, ... 229
§ 3. Circulation, ... 231
§ 4. Innervation, ... 236
§ 5. Secretions, ... 236

CHAPTER VI.—Diagnosis of Pregnancy, ... 237

Article I.—Rational Signs, ... 237

Article II.—Sensible Signs, ... 242
§ 1. The Touch, ... 242
Vaginal Touch, ... 243
Anal Touch, ... 245
Ballottement, ... 245
§ 2. Abdominal Palpation, ... 247
§ 3. Active Motions of the Fœtus, ... 250
§ 4. Auscultation, ... 252
1. Sounds of the Heart, ... 253
2. Souffle of the Cord, ... 257
3. Uterine Souffle, ... 258

CHAPTER VII.—Twin Pregnancy, ... 269

PART III.

OF LABOR.

PAGE

CHAPTER I.—CAUSES OF NATURAL LABOR, ... 276

§ 1. Efficient Causes, ... 276
§ 2. Determining Causes, ... 280

CHAPTER II.—PHYSIOLOGICAL PHENOMENA OF LABOR, ... 284

§ 1. Pain and Contraction, ... 288
§ 2. Dilatation of the Neck, ... 292
§ 3. Glairy Discharges, ... 293
§ 4. Bag of Waters, ... 294
§ 5. Duration of Labor, ... 297
§ 6. Effect of Labor upon the Mother and Child, ... 300

CHAPTER III.—MECHANICAL PHENOMENA OF LABOR, ... 304

ARTICLE I.—Presentations and Positions, ... 304
ARTICLE II.—Presentation of the Vertex, ... 314
§ 1. Causes, ... 314
§ 2. Diagnosis, ... 315
§ 3. Mechanism, ... 317
§ 4. Inclined or Irregular Presentation of the Vertex, ... 331
§ 5. Prognosis, ... 331

ARTICLE III.—Face Presentation, ... 335
§ 1. Causes, ... 335
§ 2. Diagnosis, ... 336
§ 3. Mechanism, ... 338
§ 4. Inclined or Irregular Presentations, ... 345
§ 5. Prognosis, ... 345

ARTICLE IV.—Presentation of the Pelvic Extremity, ... 347
§ 1. Causes, ... 349
§ 2. Diagnosis, ... 349
§ 3. Mechanism, ... 351
§ 4. Prognosis, ... 357

ARTICLE V.—Presentation of the Trunk, ... 361
§ 1. Causes, ... 362
§ 2. Diagnosis, ... 363
§ 3. Mechanism, ... 366
Spontaneous Version, ... 366
Spontaneous Evolution, ... 368
§ 4. Prognosis, ... 371

PAGE
ARTICLE VI.—Recapitulation of the Mechanism of Labor in general, . 371

CHAPTER IV.—TWIN LABOR, ... 375

CHAPTER V.—PREMATURE AND RETARDED LABOR, ... 377
ARTICLE I.—Premature Labor, ... 377
ARTICLE II.—Retarded Labor, ... 379

CHAPTER VI.—NATURAL DELIVERY OF THE PLACENTA, . . . 381

CHAPTER VII.—ATTENTIONS TO THE WOMAN AND CHILD DURING LABOR, 388
ARTICLE I.—Attentions to the Woman during Labor, ... 388
ARTICLE II.—Attentions to the Child during Labor, ... 399

CHAPTER VIII.—ATTENTIONS TO THE WOMAN AND CHILD IMMEDIATELY AFTER LABOR, ... 405
ARTICLE I.—Attentions to the Woman immediately after Labor, . . 405
ARTICLE II.—Attentions to the Child immediately after Birth, . . 406
§ 1. When the Child is healthy 406
§ 2. When the Child is weak or diseased, ... 409

CHAPTER IX.—PHENOMENA OF THE LYING-IN STATE, ... 421
§ 1. After-pains, ... 429
§ 2. Lochia, ... 431
§ 3. Secretion of Milk, ... 435

CHAPTER X.—ATTENTIONS TO THE WOMAN DURING HER LYING-IN, . 439

PART IV.

PATHOLOGY OF PREGNANCY.

CHAPTER I.—DISEASES WHICH MAY EXIST DURING PREGNANCY, . . 443
§ 1. Epidemic Diseases, ... 443
Grippe or Influenza, ... 443
Cholera, ... 444
§ 2. Endemic Diseases, ... 445
Intermittent Fever, ... 445
§ 3. Eruptive Fevers, ... 446
Variola, ... 446

PAGE
Scarlatina, ... 447
Roseola, ... 448
§ 4. Various Sporadic Diseases, ... 448
Typhoid Fever, ... 448
Pneumonia, ... 448
Various Inflammations, ... 449
Icterus, ... 449
Syphilis, ... 451
Saturnine Intoxication, ... 453
Phthisis, ... 453
Hysteria, Epilepsy, Chlorosis, ... 455
§ 5. Surgical Affections, ... 455
§ 6. Hypertrophy of the Thyroid Gland, ... 457
§ 7. Ulceration of the Neck of the Uterus, ... 457

CHAPTER II.—Diseases of Pregnancy, ... 461

Article I.—Lesions of Digestion, ... 463
§ 1. Anorexia, ... 463
§ 2. Pica, Pyrosis, ... 464
§ 3. Vomiting, ... 464
1. Simple Vomiting, ... 465
2. Intractable Vomiting, ... 467
3. Treatment of Vomiting, ... 470
A. Medical Treatment, ... 470
B. Surgical Treatment, ... 474
§ 4. Constipation ; Diarrhœa, ... 477

Article II.—Lesions of Respiration, ... 478

Article III.—Lesions of Circulation, ... 479
§ 1. Plethora ; Hydræmia, ... 479
§ 2. Hemorrhage, ... 486
§ 3. Varicose Veins ; Hemorrhoids, ... 487

Article IV.—Lesions of the Secretions and Excretions, ... 488
§ 1. Ptyalism, ... 488
§ 2. Excretion of Urine, ... 489
§ 3. Albuminuria; Uræmia, ... 490
§ 4. Dropsy of the Cellular Tissue, ... 500
§ 5. Ascites, ... 502

Article V.—Lesions of Innervation, ... 505
§ 1. Eclampsia, ... 505
§ 2. Vertigo ; Syncope, ... 505
§ 3. Various Forms of Neuralgia; Odontalgia, ... 507
§ 4. Paralysis, ... 507
§ 5. Intellectual Disorders. Mania, ... 510

PAGE
Article VI.—Diseases of the Skin, ... 512
§ 1. Itching, ... 512
§ 2. Pigmentary Spots 513
Article VII.—Lesions of the Pelvic Articulations, ... 514
§ 1. Relaxation of the Symphysis, ... 514
§ 2. Inflammation of the Symphysis, ... 516
Article VIII.—Diseases of the Vulva and Vagina, ... 517
§ 1. Pruritus of the Vulva, ... 517
§ 2. Leucorrhœa, ... 518
§ 3. Vegetations, ... 519
Article IX.—Abdominal and Uterine Pains, ... 520
§ 1. Abdominal, Lumbar, and Inguinal Pains, ... 520
§ 2. Uterine Pains, ... 522
§ 3. Rheumatism of the Uterus, ... 524
Article X.—Displacements of the Uterus, ... 528
§ 1. Prolapsus, ... 528
§ 2. Retroversion, ... 532
§ 3. Anteversion, ... 539
§ 4. Lateral Obliquity, ... 541
CHAPTER III.—Diseases of the Ovum, ... 541
Article I.—Dropsy, ... 541
§ 1. Dropsy of the Amnion, ... 541
§ 2. Hydrorrhœa, ... 545
§ 3. Dropsy of the Villi of the Chorion, (Hydatiform Mole,) . 547
Article II.—Lesions of the Placental Villi, ... 549
Fibrous Obliteration, ... 550
Article III.—Effusions of Blood in the Placenta, ... 552
Placental Apoplexy, ... 554
CHAPTER IV.—Diseases and Death of the Fœtus, ... 556
§ 1. Diseases of the Fœtus, ... 556
§ 2. Death of the Fœtus, ... 558
CHAPTER V.—Abortion, ... 560
Article I.—Causes, ... 561
§ 1. Causes of Spontaneous Abortion, ... 561
§ 2. Causes of Accidental Abortion, ... 566
§ 3. Causes of Induced Abortion, ... 567
Article II.—Symptoms of Abortion, ... 567
Article III.—Diagnosis, ... 571

PAGE
ARTICLE IV.—Delivery of the Placenta in Abortion, ... 575
ARTICLE V.—Prognosis, ... 578
ARTICLE VI.—Treatment, ... 579

CHAPTER VI.—EXTRA-UTERINE PREGNANCY, ... 585
Pathological Anatomy, ... 591
Symptoms, ... 594
Progress, ... 596
Causes, ... 598
Treatment, ... 601

PART V.

DYSTOCIA.

CHAPTER I.—DEFICIENT OR EXCESSIVE EXPULSIVE POWER, ... 605
ARTICLE I.—Tedious Labor, ... 605
§ 1. Feeble Contractions, ... 607
§ 2. Lessening of Contractions, ... 609
§ 3. Irregularity of Pains, ... 611
§ 4. Effect of the Contraction of the Walls of the Abdomen, . 612
ARTICLE II.—Too Rapid Labor, ... 613

CHAPTER II.—DEFORMITIES OF THE PELVIS, ... 616
Pelvis too Large, ... 617
Pelvis too Small, ... 618
ARTICLE I.—Pathological Anatomy, ... 619
§ 1. Smallness without Deformity, ... 619
§ 2. Smallness with Deformity, ... 620
ARTICLE II.—Causes and Mode of Production, ... 625
§ 1. Absolute Contraction, ... 626
§ 2. Rachitis, ... 626
§ 3. Osteomalacia, ... 629
§ 4. Oblique Oval Pelvis, ... 630
§ 5. Previous Deformity of another Part of the Skeleton, . . 634
A. Inflection of the Vertebral Column, ... 635
B. Congenital Luxations of the Femur, ... 635
C. Non-Congenital Luxations, ... 640
D. Lesions of the Lower Extremities, ... 640

PAGE

Article III.—Effect of Deformity of the Pelvis upon Pregnancy and Labor, ... 641

Article IV.—Diagnosis of Deformities, ... 649
§ 1. Rational Signs, ... 649
§ 2. Sensible Signs, ... 653

Article V.—Indications afforded by Deformities of the Pelvis, . 668
§ 1. Indications in Pelves of 3¾ Inches at least, ... 669
§ 2. Indications in Pelves of from 3¾ Inches to 2⅝ Inches, . . 671
§ 3. Indications in Pelves below 2⅝ Inches, ... 673

CHAPTER III.—Bony Tumors, ... 674
§ 1. Exostoses, ... 675
§ 2. Enchondroma, ... 676
§ 3. Osteosteatoma, ... 676
§ 4. Osteo-sarcoma, ... 676
§ 5. Irregular Callus, ... 676

CHAPTER IV.—Extreme Resistance of the External Genital Parts, 677
§ 1. Smallness and Rigidity of the Vulva, ... 677
§ 2. Rigidity of the Perineum, ... 678
Rupture of the Perineum, ... 680

CHAPTER V.—Deformities of the Vulva and Vagina, . . . 681
§ 1. Adhesion of the Labia Majora and Minora, ... 681
§ 2. Persistence of the Hymen, ... 681
§ 3. Deformed Cicatrices, ... 681
§ 4. Deformities of the Vagina, ... 683
§ 5. Inversion of the Vagina, ... 685

CHAPTER VI.—Tumors of the Vulva and Vagina, ... 686
§ 1. Œdema of the Labia Majora, ... 686
§ 2. Thrombus, ... 686
§ 3. Various Tumors, ... 695

CHAPTER VII.—Difficulties due to the Neck of the Uterus, . . 696
§ 1. Agglutination of the External Orifice, ... 696
§ 2. Complete Obliteration of the Cervix, ... 697
§ 3. Rigidity of the Cervix, ... 698
§ 4. Spasmodic Contraction of the Cervix, ... 699
§ 5. Obliquity of the Orifice, ... 702
§ 6. Tumefaction of the Anterior Lip, ... 703
§ 7. Abscess of the Lips of the Cervix, ... 704
§ 8. Thrombus of the Lips of the Cervix, ... 705
§ 9. Fibrous Tumors and Polypi of the Cervix, ... 706

PAGE
§ 10. Fungous Tumors of the Cervix, ... 710
§ 11. Encysted Tumors of the Cervix, ... 710
§ 12. Induration and Hypertrophy of the Cervix, . . . 711
§ 13. Cancer of the Cervix, ... 711

CHAPTER VIII.—Difficulties due to the Body of the Uterus, . 713
§ 1. Obliquity of the Uterus, ... 713
1. Anterior Obliquity, ... 713
2. Posterior Obliquity, ... 714
3. Lateral Obliquity, ... 718
4. Treatment of Obliquity, ... 718
§ 2. Hernia of the Womb, ... 719
§ 3. Prolapsus of the Womb, ... 720
§ 4. Tumors of the Body of the Womb, ... 721

CHAPTER IX.—Tumors of the Parts adjacent to the Pelvic Canal and of the Cellular Tissue of the Cavity of the Pelvis, . 723
§ 1. Tumors of the Ovary, ... 723
§ 2. Tumors of the Fallopian Tube, ... 725
§ 3. Tumors of the Rectum, ... 725
§ 4. Tumors of the Bladder, ... 726
§ 5. Hernial Tumors, ... 728
§ 6. Tumors of the Cellular Tissue, ... 731

CHAPTER X.—Rupture of the Uterus and Vagina, ... 732
Article I.—Rupture of the Uterus, ... 732
§ 1. Causes, ... 733
§ 2. Symptoms, ... 737
§ 3. Prognosis and Termination, ... 739
§ 4. Pathological Anatomy, ... 741
§ 5. Treatment, ... 743
Article II.—Rupture of the Vagina, ... 745

CHAPTER XI.—Puerperal Hemorrhage, ... 747
Article I.—Causes of Puerperal Hemorrhage, ... 748
§ 1. Predisposing Causes, ... 748
§ 2. Determining Causes, ... 753
§ 3. Special Causes, ... 754
Abnormal Insertion of the Placenta, ... 754
Rupture of the Vessels of the Cord, ... 758
Rapid Retraction of the Uterus, ... 762
Article II.—Symptoms of Puerperal Hemorrhage, ... 763

PAGE
ARTICLE III.—Diagnosis, ... 765
A. External Discharge, ... 765
Hemorrhage from Abnormal Insertion of the Placenta, . . 766
Hemorrhage from Rupture of the Umbilical Vessels, . . 768
B. Internal Hemorrhage, ... 769

ARTICLE IV.—Prognosis, ... 770
Prognosis of External and Internal Hemorrhage, . . 770
Prognosis of Hemorrhage from Abnormal Insertion of the Placenta, ... 773

ARTICLE V.—Treatment, ... 775
§ 1. General Therapeutic Measures, ... 776
§ 2. Special Therapeutic Measures, ... 776
A. Slight Hemorrhage within the three last Months of Gestation, ... 776
B. Serious Hemorrhage within the three last Months of Gestation, ... 777
C. Slight Hemorrhage during Labor, ... 783
D. Serious Hemorrhage during Labor, ... 783
§ 3. Treatment of Hemorrhage from Abnormal Insertion of the Placenta, ... 785
§ 4. Recapitulation of Treatment, ... 786

CHAPTER XII.—ECLAMPSIA, ... 788
§ 1. Causes, ... 791
§ 2. Symptoms, ... 796
§ 3. Termination, ... 802
§ 4. Diagnosis, ... 804
§ 5. Prognosis, ... 805
§ 6. Pathological Anatomy, ... 808
§ 7. Nature, ... 810
§ 8. Treatment, ... 812
1. Preventive Treatment, ... 812
2. Curative Treatment, ... 814

CHAPTER XIII.—DISEASES WHICH MAY COMPLICATE LABOR, . . . 824
Hemoptysis; Hematemesis, ... 824
Aneurismal Tumors, ... 825
Asthma, ... 825
Hernia, ... 825
Syncope, ... 826
Exhaustion, ... 826
Emphysema, ... 827
Fracture of the Sternum, ... 828

CHAPTER XIV.—DYSTOCIA DUE TO THE FŒTAL APPENDAGES, . . 828

PAGE
ARTICLE I.—Prolapsus, or Falling of the Cord, ... 828
ARTICLE II.—Shortness of the Cord, ... 834

CHAPTER XV.—DIFFICULTY DUE TO THE FŒTUS, ... 839

ARTICLE I.—Extreme Size, ... 839
Too Great General Size, ... 839
Too Great Size of the Head, ... 839
Too Great Size of the Shoulders, ... 839

ARTICLE II.—Irregular or Complicated Presentations and Positions: Anomalies in the Mechanism of Labor, ... 841
§ 1. Inclined Positions of the Vertex: Irregularities of Mechanism, 841
§ 2. Inclined Positions of the Pelvis: Irregularities of Mechanism, 844
§ 3. Inclined Positions of the Face: Irregularities of Mechanism, 844
§ 4. Presentation of the Body, ... 849
§ 5. Complicated Presentations, ... 849

ARTICLE III.—Diseases of the Fœtus, ... 854
§ 1. Hydrocephalus, ... 854
§ 2. Hydrothorax; Ascites; Retention of Urine, ... 858
§ 3. Emphysema of the Fœtus, ... 859
§ 4. Various Tumors, ... 860
§ 5. Anchylosis of Articulations of the Fœtus: Gibbosities, . 862

ARTICLE IV.—Fœtal Monstrosities, ... 862

ARTICLE V.—Dystocia due to Multiple Fœtuses, ... 863
§ 1. Multiple and Detached Fœtuses, ... 863
§ 2. Multiple and Adherent Fœtuses, ... 866

CHAPTER XVI.—ARTIFICIAL DELIVERY OF THE PLACENTA, ... 868

ARTICLE I.—Difficulties in the Delivery of the Placenta, ... 868
§ 1. Inertia of the Womb, ... 868
§ 2. Extreme Size of the Placenta, ... 869
§ 3. Weakness of the Cord, ... 870
§ 4. Irregular or Spasmodic Contractions of the Womb, . . 870
§ 5. Abnormal Adhesions, ... 875
§ 6. Retention of a Part or of the Whole of the Placenta, . . 879

ARTICLE II.—Accidents in the Delivery of the Placenta, . . . 884
§ 1. Hemorrhage, ... 884
A. Causes, ... 884
B. Symptoms, ... 885
C. Diagnosis, ... 887
D. Prognosis, ... 888
E. Treatment, ... 888
§ 2. Secondary Hemorrhage, ... 898
§ 3. Hemorrhage from the Umbilical Cord, ... 901

PAGE
§ 4. Inversion of the Womb, ... 902
§ 5. Rupture of the Womb, ... 906
§ 6. Eclampsia, ... 906

PART VI.

THERAPEUTICS.

CHAPTER I.—ERGOT, ... 907
CHAPTER II.—OF THE EFFECT OF BLEEDING AND A DEBILITATING REGIMEN UPON THE DEVELOPMENT OF THE CHILD, ... 911

PART VII.

OBSTETRICAL OPERATIONS.

CHAPTER I.—ON THE USE OF ANÆSTHETICS IN OBSTETRIC PRACTICE, . 915
CHAPTER II.—THE TAMPON, ... 927
CHAPTER III.—VERSION, ... 929
ARTICLE I.—Version by External Manipulation, ... 930
ARTICLE II.—Pelvic Version, ... 936
§ 1. Precautions to be Observed, ... 937
§ 2. Needful Conditions, ... 938
§ 3. General Rules of the Operation, ... 939
§ 4. Difficulties of Version, ... 945
§ 5. Appreciation of Version, ... 952
§ 6. Version in the Various Presentations, ... 953
CHAPTER IV.—THE FORCEPS, ... 959
ARTICLE I.—Preliminary Precautions, ... 964
ARTICLE II.—General Rules, ... 965
ARTICLE III.—Special Rules, ... 971
§ 1. When the Head is at the Inferior Strait, ... 971
§ 2. When the Head is at the Superior Strait, ... 977
§ 3. When the Head is above the Superior Strait, ... 978
§ 4. Application of the Forceps in Face Positions, ... 980
§ 5. Application of the Forceps upon the Head after the Body is Delivered, ... 983
§ 6. General Considerations upon the Use of the Forceps, . . 985

PAGE
CHAPTER V.—The Lever, or Vectis, ... 995

CHAPTER VI.—Premature Artificial Delivery, ... 1000

Article I.—Cases requiring Premature Delivery, ... 1002

Article II.—Modes of Operating, ... 1007

A. External Stimulation of the Body of the Womb, . . . 1008
B. Stimulation of the Periphery of the Os Tincæ, . . . 1009
C. Dilatation of the Cervix, ... 1011
D. Irritants introduced between the Walls of the Uterus and the Ovum, ... 1015
E. Puncture of the Membranes, ... 1019
Appreciation, ... 1021

CHAPTER VII.—Production of Abortion, ... 1022

CHAPTER VIII.—Symphyseotomy, ... 1025

CHAPTER IX.—Cæsarean Operation, ... 1030

§ 1. Cæsarean Operation on the Living Female, ... 1031
§ 2. Cæsarean Operation *post-mortem*, ... 1038

CHAPTER X.—Embryotomy, ... 1040

Article I.—Craniotomy, ... 1040

Article II.—Cephalotripsy, ... 1045

Article III.—Section of the Neck and of the Body, ... 1058

PART VIII.

HYGIENE OF CHILDREN FROM BIRTH TO THE PERIOD OF WEANING.

CHAPTER I.—Lactation, ... 1062

CHAPTER II.—Nursing of Children, ... 1069

Article I.—Nursing by the Mother, ... 1069

Article II.—Weaning, ... 1080

Article III.—Regimen of Nursing Women, ... 1082

Article IV.—Difficulties and Accidents of Maternal Nursing, . 1083

Article V.—Mixed Nursing, ... 1093

Article VI.—Nursing by a Nurse, ... 1095

Article VII.—Nursing by a Female Animal, ... 1102

Article VIII.—Artificial Nursing, ... 1103

CHAPTER III.—General Hygiene of Children, ... 1104

A

TREATISE ON MIDWIFERY.

PART I.

OF THE FEMALE ORGANS OF GENERATION.

THE female organs subservient to generation are: the *ovaries*, the principal function of which is the secretion of the ovule or female germ; the *Fallopian tubes*, designed to receive the ovule, and conduct it into the cavity of the uterus; the *uterus*, a kind of receptacle, whose office it is to contain the fecundated germ during its period of development, and to expel it immediately afterward; finally, the *vagina*, a membranous canal extending from the neck of the uterus to the external genital parts. Most of these organs are situated within a large cavity, the walls of which are composed of bones and soft parts; the cavity is termed the *cavity of the pelvis*, or *pelvic cavity*. On account of the importance of the pelvis as an organ both of protection and transmission, we shall, with it, begin the study of the organs of generation.

CHAPTER I.

OF THE PELVIS.

THE *basin*, in Latin, *pelvis*, is a large, irregular, bony cavity, a sort of curved canal, which terminates the trunk inferiorly, and sustains it by its posterior part. It is placed directly upon the lower extremities, which afford it points of support, and to which, in the erect posture, it transmits the weight of the upper portions of the body. Its position in an adult of ordinary stature is, in general, about the central part of the whole trunk. In the infant at term, and more especially during the intra-uterine life, it is much below this point; and at a certain period of fœtal existence, when the lower extremities resemble as yet but little nipples, it even occupies the inferior portion of the body. Especially should the accoucheur study the pelvis in its totality and in its relations with the great function which it subserves. Now as the best way of understanding a whole is to decompose it, and study separately its constituent parts, we shall proceed at once to consider individually the bones which enter into the composition of the pelvis.

ARTICLE I.

BONES OF THE PELVIS.

The bones which together constitute the pelvis are: the *sacrum*, and the *coccyx*, both placed behind and on the median line, and the *ossà innominata* or *coxal bones*. These last are in pairs, being situated at the sides and articulating with each other in front.

§ 1. Of the Sacrum.

This is a symmetrical, triangular bone, which is curved forward at its lower part, and is placed at the posterior part of the pelvis, where it appears like a wedge, forced in between the two ossa innominata, immediately below the vertebral column, and directly above the coccyx. It is traversed longitudinally by the sacral canal (a continuation of the vertebral canal), and, relatively to the axis of the body, it is directed from above downwards, and from before backwards; hence the column represented by it forms an obtuse angle with the lumbar vertebræ, being salient in front, and receding behind. This point is called the *promontory*, or the *sacro-vertebral* angle. Besides this direction, the sacrum is curved upon itself from behind forwards, so as to present an anterior concavity, the hollow of the sacrum: this curvature is generally much more marked in the female than in the male.

Anatomists describe the bone as having two faces, two borders, a base, and an apex.

1. The *spinal*, or *posterior face*, is convex, rough, and very irregular, presenting on the median line three, four, or five prominences, the longest of which are above, and continuous with the ridge formed by the series of spinous processes of the vertebræ; lower down, the sacral canal is terminated as a triangular gutter, being bounded laterally by two tubercles, called the *cornua* of the sacrum; upon each side of, and close to the median line, a large furrow exists, at the bottom of which the four posterior sacral foramina are seen, communicating with the vertebral canal, and serving to transmit the nerves of the same name. Outside of these foramina we find a series of elevations, apparently analogous to the transverse processes of the vertebræ; and above them two irregular fossæ, into which the posterior sacro-iliac ligaments are inserted.

2. The *pelvic*, or *anterior face*, is smooth and concave, and is traversed by four prominent transverse lines, the remnants of the sutures between the different pieces that composed the bone in early infancy, and which served to separate some superficial, transverse, and quadrilateral grooves found there, from each other. Sometimes the first of these prominent lines

is so well marked as to be mistaken, when practising the touch, for the sacro-vertebral angle.

The anterior sacral foramina, four in number, are found nearer the lateral margins; they communicate with the sacral canal, and transmit the anterior branches of the nerves of the same name. Beyond the foramina is an unequal surface for the attachment of the pyramidal muscles.

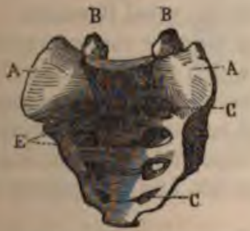
3. The *borders* of the sacrum may be divided into two portions. 1. The superior, being very thick, presents, on its anterior half, a semilunar articular facet for joining with the coxal bone, and on its posterior part an excavation, and some rough projections for the attachment of the sacro-iliac ligaments. The other, or inferior portion, is quite thin, and is occupied by the insertion of the sacro-sciatic ligaments.

4. The *base* is directed upwardly and a little in front, and has its greatest diameter transversely. An oval facet, more or less inclined backwards, surmounts it at the middle, whereby the bone is articulated with the last lumbar vertebra. Upon each side is seen a smooth surface, which is concave transversely, and convex from before backwards. These surfaces incline forwards and are continuous with the iliac fossæ, being covered, in the recent subject, by the anterior sacro-iliac ligaments. They are separated from the anterior face of the sacrum by a rounded border, which forms, as we shall hereafter learn, the posterior part of the superior strait. The two surfaces constitute the *wings of the sacrum.* Behind, are found the upper orifice of the sacral canal, and the two articular processes of the first piece of the sacrum.

5. The *apex* of the sacrum is directed downwards, and a little backwards; presenting an oval facet for the articulation of the coccyx.

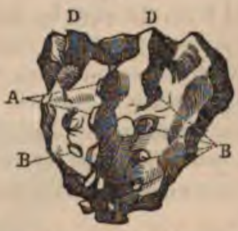
6. The *sacral canal*, hollowed out in the thickness of the bone, is the termination of the vertebral canal; being triangular and broad superiorly, it becomes narrow and flattened at its inferior part, where it degenerates into a gutter, that is converted into a canal by the ligaments. This lodges the sacral nerves, and communicates both with the anterior and the posterior sacral foramina.

FIG. 1.



Anterior surface of the sacrum.

FIG. 2.



Posterior surface of the sacrum.

FIG. 1. A. Ala or wings of the sacrum. B. Articular processes. C. Anterior sacral foramina. E. Points of attachment of the right pyramidal muscle.

FIG. 2. A. Ridge formed by the spinous processes. B. Posterior sacral foramina. D. Articular processes.

The sacrum, although quite thick, is a very light and spongy bone. Besides, it is pierced by a great number of foramina, and traversed by a central cavity, which serve to diminish its weight still more.

It is formed of five principal pieces (false sacral vertebræ), sometimes of six, and in one case seven were observed (Portal). In Sœmmering's cabinet are three specimens which present but four pieces.

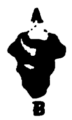
The *development* of the sacrum is analogous to that of the vertebræ, and takes place from thirty-four or thirty-five points of ossification, arranged in the following manner:

1. Five of them, placed one over the other, occupy the anterior and middle parts. 2. In each of the interspaces which separate these, two small osseous laminæ are developed some time after birth, which seem to form their articular surfaces. 3. Ten are situated in front and upon each side of the latter, that is, one for each lateral portion of the four or five primitive bones. 4. And behind them six others are developed, between which: 5. There appear three or four that correspond with the spinous processes, or their laminæ; and 6. Lastly, there is one upon each side above the iliac surface, for the articular facet.

§ 2. The Coccyx.

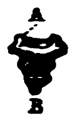
This name is given to an assemblage of three or four, occasionally five little bones, united with each other on the median line of the body, and apparently suspended at the point of the sacrum, of which, indeed, they appear to be only a movable appendage, continuing its line of curvature forwards.

Fig. 3.



Posterior surface of the coccyx.
Fig. 3. A. Cornua of the coccyx. B. Apex.

Fig. 4.



Anterior surface of the coccyx.
Fig. 4. A. Cornua of the coccyx. B. Apex.

M. Cruveilhier declares that he has known it, in some cases, to form a right angle or even an acute one with the sacrum. As a whole, the coccyx represents a triangular and symmetrical bone.

1. Its *spinal, or posterior face*, is convex and irregular, and is only separated from the skin by the posterior sacro-coccygeal ligament.

2. Its *pelvic, or anterior face*, is smooth and slightly concave, and lies in contact with the termination of the rectum, which rests upon it. Like the preceding bone, it is marked by certain transverse grooves, corresponding with the intervals which had, for a long period, separated its different pieces.

3. Its *two lateral borders* are quite irregular, and are occupied by the attachments of the anterior sacro-sciatic ligaments, and the ischio-coccygeal muscles.

4. Its slightly concave *base* presents, above, an oval surface, which articulates with the apex of the sacrum, and behind, two little tubercles called the *cornua* of the coccyx.

5. The *apex* is rounded, irregular, and sometimes bifurcated, affording attachment to the levator ani muscle.

The coccyx is developed from four or five centres of ossification, that is, one for each of its parts.

§ 3. The Coxal Bone, Haunch Bone, or Os Innominatum.

This is a non-symmetrical, quadrilateral bone, curved upon itself, as if twisted in two different directions, contracted in its middle, and of a very irregular figure. The pair occupy the lateral and anterior parts of the pelvis. It presents an internal and external face, and four borders, for our consideration.

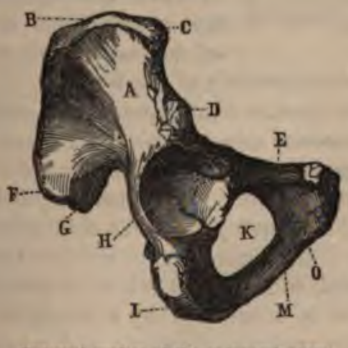
1. The *external*, or *femoral surface*, is turned outwards, backwards, and downwards, at its superior part, while inferiorly, it looks forward.

At its superior and posterior portion is seen an unequal, narrow, and convex surface, affording origin to the gluteus maximus muscle, and terminated below by a slightly elevated circular ridge, called the *superior curved line*. Beneath this, there is a larger surface, which is concave behind, narrowed in front for the insertion of the gluteus medius muscle, and bounded by a slight ridge below, called the *inferior curved line;* still lower, there is a third extensive and convex surface, serving for the attachment of the gluteus minimus muscle. All that portion of the femoral face just described forms a large fossa, alternately concave and convex, bearing the name of the *external iliac fossa.*

Towards the front, the external face presents the cotyloid cavity or the acetabulum, at its superior part; and a little more in advance and below, the sub-pubic, or *obturator foramen*. This opening is triangular, with rounded angles; its long diameter is inclined downwards and outwards, and its circumference is sharp and irregular, presenting above a groove, directed obliquely from behind forwards and from without inwards, through which the obturator vessels and nerves pass out. A fibrous membrane that subtends the foramen is attached to its periphery, except in the immediate vicinity of the groove.

Upon the upper side of the obturator foramen, between it and the median line, there is a concave or nearly plane surface for the origin of several muscles.

Fig. 5.



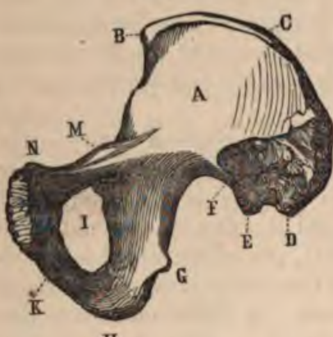
External surface of the os innominatum.

A. External iliac fossa. B. Crest of the ilium. C. Anterior superior spine of the ilium. D. Anterior inferior spine of the ilium. E. Horizontal branch of the pubis. F. Posterior superior spine of the ilium. G. Posterior inferior spine of the ilium. H. Cotyloid cavity. I. Ischium. K. Sub-pubic or obturator foramen. M. Ischio-pubic ramus. O. Descending branch of the pubis.

2. The *abdominal*, or *internal face*, is directed forwards at its upper part, and backwards at the lower. It may be divided into two portions, the superior of which is characterized by a large excavation, called the *internal iliac fossa*, by a semilunar articular surface found just behind this fossa, and called the *auricular facet*, and still more posteriorly, by some rugosities, analogous to those found on the articular faces of the sacrum.

The superior portion is terminated below by a large, rounded, and concave line, which separates it from the other moiety. The latter, or inferior portion, presents behind a nearly triangular plane surface, which corresponds to the cotyloid cavity and to the body of the ischium; near its middle, we find the obturator foramen, and in front, the internal face of the pubis and of the ischio-pubic ramus.

FIG. 6.



Internal surface of the right os innominatum.

A. Internal iliac fossa. B. Anterior superior spinous process of the ilium. C. Crest of the ilium. D. Posterior superior spinous process of the ilium. E. Posterior inferior spinous process of the ilium. F. Articular surface. G. Spine of the ischium. H. Tuberosity of the ischium. I. Sub-pubic or obturator foramen. K. Ischio-pubic ramus. M. Ilio-pectineal eminence. N. Spine of the pubis.

3. *Borders.* These are four in number. The posterior one has a very irregular shape, being oblique from above downwards, and from without inwards. The *posterior superior spinous process* is found at its junction with the superior border. This prominent, well-marked eminence is separated by a rough margin from another though less voluminous one, called the *posterior inferior spinous process.*

Below this last apophysis, the student will observe a very deep notch, which contributes to the formation of the great sciatic foramen, and is terminated below by a triangular, pointed projection, bearing the title of the *spine of the ischium.* This process is more or less prominent in different individuals, and is sometimes directed inwards. A groove is seen just beneath it, in which the tendon of the obturator internus muscle plays; this groove is a part of the *lesser sciatic* notch; and lastly, this border terminates at the tuberosity of the ischium.

The anterior border is concave, oblique above, and nearly horizontal in front. The *anterior superior spinous process* is formed by its union with the superior border. A considerable depression exists under this apophysis, which separates it from another one, called the *anterior inferior spinous process.* Then we find a groove just under this elevation, for the gliding of the conjoint tendon of the psoas magnus and the iliacus internus muscles; which groove is bounded, in front and below, by the *ilio-pectineal eminence.* And lastly, the border is terminated by a triangular horizontal surface, which is directed downwards and forwards, and is broader externally than internally, and by the spine and angle of the pubis.

The *superior border* or *crest of the ilium* is thick, convex, and inclined outwards, excepting at its posterior part, where it looks slightly inwards—

being twisted, in its course, somewhat like an italic *f*. Anatomists have subdivided it into the external and internal lips, and the intervening space. The anterior superior spinous process bounds it in front, and the posterior superior one behind.

The *inferior border* is shorter than either of the others; it presents, however, three parts for study. There is an oval surface above, for articulating with its fellow of the opposite side, forming the symphysis; below, it is terminated by the tuberosity of the ischium, and in the middle, we find the *ischio-pubic ramus;* this is a sharp ridge, formed superiorly by the descending branch of the pubis, and inferiorly by the ascending portion of the ischium.

The coxal bone is developed from the principal centres of ossification, which appear at the same time in the iliac fossa, the tuberosity of the ischium, and in the pubis. Owing to this mode of growth, it has been customary to divide the os innominatum into three portions: the superior one, styled the *ilium*, forms, in a great measure, the contour and prominence of the hip; the *pubis*, being anterior, supports the genital organs; and the inferior one, which sustains the body when seated, is named the *ischium*.

Several years after birth, an osseous lamina resting upon the superior border of the bone, is developed to form the iliac crest, whilst a similar layer embraces the tuberosity of the ischium, and extends to its ramus; at the same time, a third centre of ossification appears for the anterior inferior spinous process of the ilium, and a fourth forms the angle of the pubis.

ARTICLE II.

ARTICULATIONS OF THE PELVIS.

[The four bones just described are united by four articulations peculiar to the pelvis; one in front for the two pubic bones, two behind for the iliac bones and the sacrum, and that of the coccyx with the sacrum. All these articulations are usually termed symphyses; thus the articulation of the two pubic bones is styled the pubic symphysis, the junction of the iliac bone with the sacrum is called the sacro-iliac symphysis, and the connection of the sacrum and coccyx the sacro-coccygeal symphysis.

It should be observed, however, that the symphyses or amphiarthroses are characterized by flat articular surfaces, united by a layer of fibrous tissue which allows a bending motion without any sliding of the bones upon each other. Now this sliding motion exists in the pelvic articulations of the female. It is, therefore, a mistake to classify them amongst the amphiarthroses, and only by an abuse of language can they continue to be called symphyses. Lenoir's researches prove that some anatomists were near the truth in considering them as arthrodia. In twenty-two female subjects between the ages of eighteen and thirty-five years, Lenoir found that the four pelvic articulations are formed by the contact of surfaces covered with cartilage and lined with synovial membranes; they present, therefore, all the characteristics of arthrodia, and have a simple, sliding motion.

To the four articulations proper, of the pelvis, it is well to add in this connection, the articulation of the sacrum with the spinal column. Here we have really one of the amphiarthroses or symphyses.

The description of the sub-pubic ligament completes the history of the ligamentous connections of the pelvis.]

§ 1. Articulation of the Pubis.

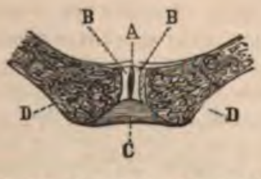
This articulation is formed by the approximation of the oval surfaces occupying the upper part of the lower border of the coxal bones. These surfaces are slightly convex and unequal, and are covered with a cartilaginous lamina which fills up the inequalities. The convex shape and the direction of their faces are such, that they only come into contact for an inconsiderable extent at their internal or posterior part, and hence they leave above, in front, and below, an open space, which is the more considerable, in proportion to the distance from the centre of the joint. The articulating surface of the two cartilages is a little facet, about six or eight lines in its vertical diameter, by two or three in its transverse one. This facet is smooth, and furnished with a synovial membrane, which is the more lubricated with synovia as the female approaches the period of labor. A considerable thickness of the interpubic ligament fills up the interval which exists between the other points of these articular surfaces.

This *interpubic ligament* is formed of a very dense fibrous substance. It has the form of a wedge, with the point forced down between the bones and the sides adhering to the rough surfaces fronting the articulation. Two planes of fibres are discoverable in it; the deeper ones, which pass from one iliac bone to the other, and are shorter in proportion to their depth, are crossed, and disposed in several layers. They constitute the *interpubic ligament* properly so called. The others, which are more superficial, are parallel, and pass obliquely from within outwards and from above downwards. Beginning at the upper part of the articulation they spread in descending, until they are finally divided into two bundles, which become lost in front of the branches of the pubic arch by mingling with the periosteum of the bones and the tendons of the muscles inserted in the vicinity. These form the *anterior pubic ligament.*

The uppermost portion of the anterior pubic ligament seems to take its origin in the fibrous cord which is inserted on the spine of the pubis, and which cushions, so to speak, the upper edge of that bone, in such a way as to efface its inequalities. It constitutes the *superior pubic ligament.*

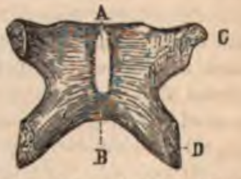
Lastly, at its lowest part, the anterior pubic ligament assumes the form of a thick triangular bundle occupying the summit of the pubic arch, and fixed by its lateral edges to the upper and internal part of the two branches thereof. This ligament, called the *triangular*, or *sub-pubic ligament*, pre-

Fig. 7.



Horizontal section through the articulation of the pubis.

Fig. 8.



Posterior view of the articulation of the pubis.

Fig. 7. A. Synovial membrane. B. Articular cartilages. C. Inter-pubic ligament. D. Section of the bones.

Fig. 8. A. Posterior projecting pad. B. Sub-pubic ligament. C. Section of horizontal branch of pubis. D. Section of ischio-pubic ramus.

sents a rounded base, which completes the arch of the pubes by giving it a regular curve calculated to facilitate the exit of the fœtus.

Thus, we have three anterior pubic ligaments, a superior pubic and a sub-pubic ligament, all of them representing a spreading out of the interosseous ligament. Behind the symphysis, the fibro-cartilaginous substance forms a sort of projecting pad, which occupies the middle part only, and disappears from above downwards.

Finally, the ligamentous arrangement of the articulation is completed by the *posterior pubic ligament*, composed of fibres extending transversely from one pubis to the other, above the projection just noticed. This ligament, which is very thin, and of moderate strength, forms the posterior lining of the synovial membrane.

§ 2. SACRO-ILIAC ARTICULATIONS.

This articulation is formed by the junction of the semilunar facets, which were pointed out in describing the border of the sacrum and the internal face of the ossa ilia.

Both these facets are covered with a diarthrodial cartilage, which is closely adapted to the inequalities they present; that, however, which pertains to the sacrum, being always much thicker than the layer which belongs to the iliac bones. The latter is so thin, that its existence has been denied. These cartilages are covered with a synovial membrane, which secretes quite abundantly a viscid and transparent synovia. But, when the female has passed the prime of life, this fluid often concretes, and becomes disposed in isolated flakes upon the articular surfaces, — a fact which has caused its true nature to be misunderstood.

A very limited sliding motion is all of which this articulation is susceptible. The bones are held together by the following ligaments:

1. The *posterior*, or *great sacro-sciatic ligament*, is found at the posterior inferior part of the pelvis. It is triangular, thin, flattened, and narrower in the middle than at the extremities. It arises by a large base from the posterior inferior spinous process of the ilium, the sacro-spinous ligament, the last of the posterior tubercles of the sacrum, and from the inferior part of the margin of this bone and border of the coccyx, and running outwards, downwards, and a little forwards, is inserted into the tuberosity of the ischium. Its fibres are arranged in such a way, that the internal ones cross the external about their middle.

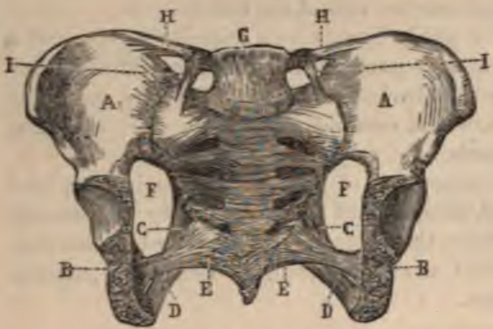
2. The *lesser sacro-sciatic ligament* is smaller than the preceding, though nearly of the same form, and situated more in front. Within, it is broad, being partially confounded with the other, but arising a little more anteriorly upon the sides of the sacrum and coccyx; thence, it passes forwards and outwards to be inserted into the spine of the ischium.

The sacro-sciatic ligaments convert the two sciatic notches into foramina. They not only serve to unite the sacrum to the ilium, but also contribute to the formation of the parietes of the pelvis.

3. The *posterior sacro-iliac ligament* is a collection of yellow, elastic, fibrous bundles, intermixed with fatty pellets, which fill up the rough

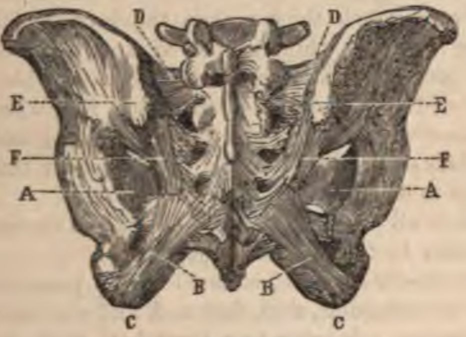
excavation observed behind the cartilaginous surfaces; very short, numerous, and interlacing in every direction, they become almost intimately blended with the sacrum and coxal bones. On account of their strength, they greatly consolidate this articulation.

Fig. 9.



Pelvis with its ligaments; the anterior portion removed.
A. Internal iliac fossa. B. Section of the bones. C. Origin of the great sacro-sciatic ligament. D. Great sacro-sciatic ligament. E. Lesser sacro-sciatic ligament. F. Great sacro-sciatic foramen. G. Last lumbar vertebræ. H. Ilio-lumbar ligament. I. Sacro-vertebral ligament.

Fig. 10.



Pelvis with its ligaments. Posterior view.
A. Great sacro-sciatic foramen, through which is seen the horizontal branch of the pubis. B. Great sacro-sciatic ligament. C. Tuberosity of the ischium. D. Posterior sacro-iliac ligament. E. Posterior superior spinous process of the ilium. F. Inferior sacro-iliac ligament.

4. The *anterior sacro-iliac ligament* is a simple fibrous lamina, extended transversely from the sacrum to the os innominatum. It is rather an expansion of the periosteum of the pelvis than a true ligament.

5. The *superior sacro-iliac ligament* is a very thick fasciculus, passing transversely from the base of the sacrum to the coxal bone.

6. The *inferior sacro-iliac ligament* (vertical sacro-iliac of M. Cruveilhier) arises from the posterior superior spinous process of the ilium, and is inserted just below the third sacral foramen into the tubercle found at the termination of the border of the sacrum; and behind, into the great sacro-sciatic ligament.

§ 3. SACRO-COCCYGEAL ARTICULATION.

This articulation, which for a long time was supposed to resemble those between the bodies of the vertebræ, differs from them materially in being a true arthrodia. It is formed by the opposition of the oval surface of the point of the sacrum to that of the base of the coccyx; the middle of the former is projecting, and corresponds to a depression in the centre of the latter. The long diameter of the articular face of the coccyx is directed transversely. The cartilages covering these surfaces are rather thinner at the centre than at the circumference. They are provided in the adult female with a synovial membrane, which is supposed by M. Lenoir to be only developed by the movements of the coccyx upon the sacrum, since he has failed to meet with it in subjects under eighteen years of age.

1. The *anterior sacro-coccygeal ligament* consists of a few parallel fibres, which descend from the anterior part of the sacrum to the corresponding face of the coccyx.

2. The posterior sacro-coccygeal ligament is flat, triangular, broader above than below, and of a dark color. Arising from the margin of the inferior orifice of the sacral canal, it descends to, and is lost upon, the whole posterior surface of the coccyx. It also aids in completing the canal behind.

In investigating upon the dead body the anatomical arrangement to which the motion of the coccyx on the sacrum is due, it was ascertained by M. Lenoir that the motion takes place almost as frequently in the sacro-coccygeal articulation, as in that of the second piece of the coccyx with the third. Sometimes it happens simultaneously in both, whilst in few cases only does it occur in the connection of the second piece with the third, or of the third with the fourth.

These inter-coccygeal articulations are similarly constructed. In all cases, in fact, in which the points of motion of the coccyx were changed, M. Lenoir discovered a more or less complete anchylosis of the articulation between the sacrum and coccyx, and of those between the bones of the coccyx itself, at points above and below the one which preserved its mobility. Then, also, wherever situated, the movable articulation was constructed as follows: 1. Of articular surfaces irregular in form but corresponding exactly, which were incrusted with diarthrodial cartilages and provided with a synovial membrane. 2. Of lax peripheral ligaments formed at the expense of the layers of fibrous substance covering the bones of the coccyx. 3. Lastly, motion was possible in every direction.

It is to be observed that ossification is more frequent and rapid in the joint between the sacrum and coccyx than in that between the first piece of the coccyx and the second; the third and fourth become fused very early. It is therefore easy to understand how the great mobility of the sacro-coccygeal articulations renders luxation possible in labor, whilst in cases of anchylosis, either fracture or a sudden separation of the united bones might occur.

During pregnancy, the ligaments of the pelvic articulations become so softened and swelled by imbibition of fluid, as to render the mobility of the articular surfaces very evident. This softening is very considerable in some cases, and may make walking, or even standing, impossible. (See Diseases of Pregnancy.)

§ 4. SACRO-VERTEBRAL SYMPHYSIS.

This is produced by the junction of the sacrum with the fifth lumbar vertebra. It is a true amphiarthrosis, as are all the vertebral articulations. It takes place at three different points, viz., between the oval facet, seen at the middle of the base of the sacrum, and the inferior surface of the body of the last vertebra; and at the two articular surfaces found near the entrance of the sacral canal.

The modes of connection are, a fibro-cartilage (which is much thicker in front than behind), the termination of the two anterior and posterior vertebral ligaments, the interspinous ligament, and lastly, the *sacro-vertebral ligament*, a short, very strong, fibrous bundle, which descends obliquely from the anterior inferior part of the transverse process of the last vertebra, downwards and outwards, towards the base of the sacrum, where it is inserted.

Further, a synovial membrane is found in the articulation between the oblique process of the sacrum and those of the vertebræ.

To these must also be added the ilio-lumbar ligament, which passes from the apex of the transverse process of the fifth lumbar vertebra to the thickest portion of the iliac crest; and the ilio-vertebral ligament formed of two fibrous bands, the superior of which arises from the middle and lateral part of the body of the last lumbar vertebra, and the inferior, from the inter-sacro-vertebral space; both are then spread out on the coxal bone.

§ 5. Obturator Membrane.

The obturator membrane still claims a description, in order to finish the history of the ligamentous apparatus of the pelvis. This, as has been remarked by M. Cruveilhier, like the sacro-sciatic ligaments already spoken of, is rather an aponeurosis serving to complete the pelvic walls, than a true ligament.

These resisting membranes are probably intended to diminish, in the hour of labor, the compression of the mother's soft parts, included between the infant's head and the osseous parietes of the pelvis, as also to favor, by their elasticity, the passage of the head through the pelvic excavation.

Obturator membrane.—This membrane subtends the foramen thyroideum, excepting at its superior part, where an opening exists, which converts the groove, intended for the passage of the obturator vessels and nerves, into a complete canal. Being inserted by its external semi-circumference into the corresponding part of the periphery of the obturator foramen, it is attached by its internal half to the posterior face of the ascending ramus of the ischium. Its surfaces afford origins for the two obturator muscles. This membrane is composed of aponeurotic fasciculi, which cross each other in every direction. (*Cruveilhier.*)

ARTICLE III.

OF THE PELVIS IN GENERAL.

Studied in its general aspect, the pelvis represents a cone, slightly flattened from before backwards; the base of which, being above, is at the same time inclined forwards, whilst the apex is directed downwards and a little backwards.

§ 1. External Surface of the Pelvis.

Anatomists have divided this surface into four regions: the anterior of which exhibits, on the median line, the front part of the symphysis pubis, which is directed from above downwards and from before backwards, at an angle with the perpendicular of some 15° to 20°; next (passing outwards) is a smooth surface, from which several muscles of the thigh arise, then the external obturator fossa, occupied in the recent subject by the muscle of the same name, and finally by the anterior half of the edge of the cotyloid cavity.

The posterior, bounded by the hinder part of the iliac crest, presents, on the median line, the ridge of the sacral spinous processes, the inferior opening of the vertebral canal, the union of the sacrum with the coccyx, and the posterior face of this latter bone.

The ten posterior sacral foramina, transmitting the nerves of the same name, are found in two deep gutters, on the sides. These grooves prolong the spinal gutters, and are occupied in the recent state by the commencement of the sacro-spinal muscles. The lateral regions may each be divided into two parts: one, the superior, is the external iliac fossa; the other, or inferior, offers, behind, the posterior aspect of the sacro-sciatic ligaments, and the plane of the notches or foramina bearing the same name; and, in front, the cotyloid cavity and the external face of the tuberosity of the ischium.

§ 2. Internal Surface.

The internal surface or cavity of the pelvis has been aptly compared to the basin of the ancient barbers. (*Vesalius.*) In fact, like those vessels, it has a superior part which spreads out freely, and is called the *great*, the *superior*, or the *abdominal* pelvis; and an inferior one, more contracted, bearing the title of the *little pelvis*, or *pelvic excavation*.

1. The *great pelvis* has a very irregular figure, and forms a species of pavilion to the entrance of the pelvis. Its walls are three in number: the anterior one is deficient in the dried skeleton, but in the living state it is supplied by the anterior abdominal muscles; its posterior parietes exhibit a notch in its middle, that is ordinarily filled up by the projection of the last lumbar vertebræ, which are usually left in connection with the pelvis, although in reality not forming any part of it. Two gutters are found on the sides of this eminence, occupied by the psoæ muscles; further outwards, the anterior part of the sacro-iliac symphyses appear, which constitute the boundaries between the posterior and lateral regions: these latter are constituted by the internal iliac fossæ, covered by the iliacus internus muscles.

2. The *lesser pelvis*, or *basin*. This forms a curved canal, larger in the middle than at its extremities, and slightly bent forward. If all the parts described as appertaining to the great pelvis be removed by the saw, as recommended by Chaussier, a species of ring will remain, whose circumference, being narrow in front and much broader behind, will furnish a correct idea of the shape of the pelvis. Four regions are found in this cavity also:

The *anterior* one is concave transversely, and is inclined upwards, having the posterior part of the pubic articulation near its middle: this is generally prominent, assuming the form of a longitudinal pad, which may in some cases project to the extent of from two to three-eighths of an inch. Towards the sides a smooth surface appears, and then the internal obturator, or subpubic fossa, having, at its upper external part, the inner orifice of the subpubic canal, through which the external obturator vessels and nerves pass out from the pelvis.

It is not at all uncommon for females to complain during labor of severe cramps in the muscles of the upper internal part of one thigh. These pains result from the pressure made by the child's head upon those nerves, as it glides over this portion of the excavation.

The *posterior region*—constituted by the front face of the sacrum and coccyx—is directed downwards, and is concave from above, downwards. It consequently exhibits those peculiarities already noticed when describing the sacrum.

The *lateral regions* present two quite distinct portions: the anterior one is wholly osseous, corresponding to the back part of the cotyloid cavity, and to the body and tuberosity of the ischium. It is directed from above downwards, from behind forwards, and from without inwards.

The posterior one is formed by the internal face of the greater and lesser sacro-sciatic ligaments, and by the internal aspect of the great and small sciatic notches, converted by them into foramina; it has an opposite direction to the former. One of these foramina is larger and situated higher up than the other, and is of an oval form. The other is triangular, smaller, and more inferior. The pyramidal muscle, the great sciatic nerve, gluteal artery, and the internal pudic vessels and nerves, escape from the pelvis through the great sciatic foramen. The small sciatic hole is filled up by the obturator internus muscle, and the internal pudic vessels and nerves, which re-enter the pelvis in order to supply the perineum.

If two vertical sections be made, the one extending on the median line through the sacrum and the pubis, dividing the pelvis into two lateral halves, and the other at right angles to the first, dividing it into anterior and posterior halves, four equal parts or quarters of the pelvis will be thereby produced, which accoucheurs have designated as the *anterior* and *posterior inclined planes.* Desormeaux included only the lateral regions of the excavation, which he divided into two equal parts, in the composition of these planes: according to him, the anterior inclined planes are continuous with the anterior region; the posterior, with the front face of the sacrum; and the spine of the ischium is found at the point of union of these two. The direction of the inclined planes is always the same, whatever be the manner in which they are formed. That is, the anterior are directed from without inwards, from above downwards, and from behind forwards; the posterior, from without inwards, from above downwards, and from before backwards—in a word, in such a way as to resemble somewhat the four sides of a lozenge which is slightly curved in its length. By most authors, these inclined planes are supposed to play an important part in the mechanism of labor: for they imagine that their direction has an immediate influence upon the movements which the head of the fœtus performs in the excavation.

In anticipating that the description of the mechanism of labor hereafter given will invalidate this assertion, we shall simply observe that the movements of rotation executed by the head, take place more frequently whilst the latter is strongly bulging out the perineum, and is so far below the inclined planes as scarcely to feel the influence of their direction, and further, that these motions often occur in an opposite direction.

The great and the lesser pelvis are separated from each other by a kind of horizontal circle, which has been designated by accoucheurs as the abdominal, or *superior strait*, the isthmus, or margin of the pelvis. Finally, the apex of the pelvis presents an opening that is limited by a circle, partly osseous, partly ligamentous, to which the name of the *inferior strait* has been applied. Consequently, these two straits are the extreme limits of the pelvic excavation.

§ 3. OF THE SUPERIOR STRAIT.

The *superior strait* is formed, behind, by the sacro-vertebral angle, and the anterior border of the wings of the sacrum: outwardly, by the rounded margin that bounds the internal iliac fossa below; and in front, by the ilio-pectineal eminence and the horizontal ramus of the pubis, terminating at the symphysis of this bone. The abdominal strait has been variously compared to an ellipse, an oval, and to the heart of a playing-card. We may assert, however, with Chaussier, that its shape is that of a curvilinear triangle, the angles of which have been rounded off, and having its base behind and the apex in front.

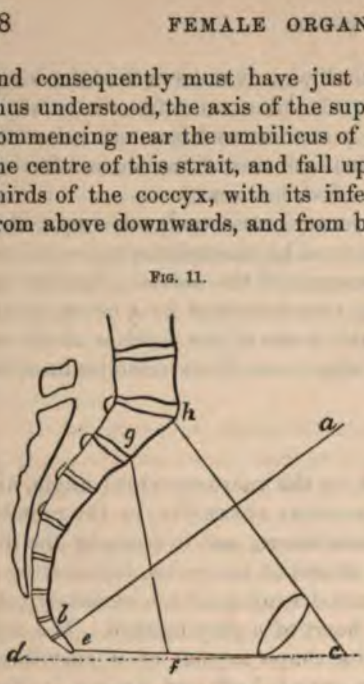
It constitutes the entrance to the lesser pelvis, and is therefore the first part of the narrow canal which the fœtus has to traverse. Hence, the pains taken by accoucheurs to study this osseous opening can readily be conceived.

All the modern authors since the days of Deventer, have endeavored to fix precisely the degree of inclination of its plane and axis, to ascertain the direction the fœtus should follow in engaging in the pelvic canal, and to determine carefully the dimensions of the latter, and their accordance with those of the body, which is to pass through it.

The plane of the superior strait is inclined obliquely from above downwards, and from behind forwards; but writers are far from being unanimous in regard to the degree of its inclination; that is, in determining the angle formed by the sacro-pubic line, at the point where it meets a horizontal one, drawn from the superior part of the symphysis pubis towards one of the points on the anterior face of the sacrum. Although originally placed at 45° by J. J. Müller (1745), this angle has successively been fixed at 35° by Levret; at 75° by Camper, and at 55° by Saxtorph; and still more recently, Professor Nægèle, after a great number of researches, has concluded to consider it as an angle of 60° (1819). It is now generally admitted that the degree of inclination in the plane of the superior strait is from 55° to 60° in the erect position of the female.

The direction of the plane being once understood, it is an easy matter to ascertain that of its axis; for the latter being a line which falls perpendicularly upon the centre of this plane, it must evidently form with the vertical the same angle that the plane itself does with the horizontal line, and consequently must have just the same degree of inclination. Being thus understood, the axis of the superior strait is a line (*a b*, Fig. 12) which, commencing near the umbilicus of the female, would pass directly through the centre of this strait, and fall upon the point of union of the upper two-thirds of the coccyx, with its inferior third. Hence, it will be directed from above downwards, and from before backwards. Further, the inclination of this plane varies according to the woman's position. Thus, it is almost nothing when recumbent, and sometimes in this position the plane of the superior strait instead of being directed forwards and upwards, even looks upwards and backwards (Dubois); when the trunk is bent strongly forwards, the inclination of the plane is diminished and becomes more nearly horizontal; towards the end of gestation, on the contrary, the inclination increases, especially when, in order to restore equilibrium, the upper part of the body is carried much backwards.

FIG. 11.

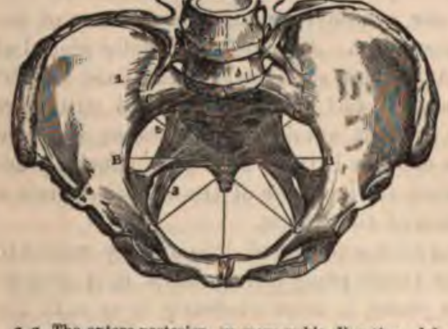


c h. The plane of the superior strait prolonged beyond the pubis. *c e*. The plane of the inferior strait prolonged beyond the pubis. *c d*. Shows the departure of this plane from the horizontal line. *a b*. The axis of the superior strait. *g f*. The axis of the inferior strait.

As the figure which represents the circumference of the superior strait is not a perfect circle, its dimensions, taken at different points, are, of course, unequal, and, accordingly, writers have admitted several diameters for it, thus:

There are three principal ones (Fig. 2), namely, an antero-posterior or sacro-pubic diameter *a a*, which extends from the sacro-vertebral angle to the upper part of the symphysis pubis; it is from four and a quarter to four and a half inches in length. 2. A transverse one, *b b*, passing from the middle of the rounded border that terminates the iliac fossa of one side, to the same point on the opposite side; this is five and a quarter inches long. 3. An oblique diameter, *c c*, extending from the anterior part of the sacro-iliac symphysis to the ilio-pectineal eminence of the opposite side; this is found on both sides, and is four and three-quarters inches long.

FIG. 12.



a a. The antero-posterior, or sacro-pubic diameter. *b b*. The transverse diameter. *c c*. The two oblique diameters. *a c*. The sacro-cotyloid interval.

Lastly, M. Velpeau admits a fourth diameter, called by him the sacro-cotyloidean; before described, however, by Burns, under the more exact name of the sacro-cotyloid interval *a c*, existing between the promontory and the posterior part of the cotyloid cavity. This interval, according to the examinations of the French surgeon, is from four to four and one-eighth inches in extent; but from the results of Nægèle and Stoltz's researches it is much less, being scarcely three and a half inches (the mean obtained from ninety pelves). The circumference of this strait varies from thirteen to seventeen inches; Levret taught, that it equalled one-fourth of the female's height; but to establish such an approximation, the development of the pelvis should always be in direct proportion to the stature of the individual, which is certainly not the fact.

§ 4. Of the Inferior Strait.

The *inferior strait*—the *perineal strait*—or *apex of the pelvis* (as it is variously called), is more irregular in shape than the superior one. Its outline presents, in fact, three tuberosities or osseous projections, separated by as many deep notches.

If, however, the advice of Chaussier be followed, and a sheet of paper be placed over this opening, so as to trace its outline with a crayon, it will be found to have an oval figure, the smaller extremity of which is in front, and the larger one, looking backwards, is broken in upon by the prominence of the coccyx. This point, disappearing at the moment of the head's passage, offers no obstacle to the delivery; and, therefore, the strait may be considered as nearly an oval.

The periphery of the pelvis at its apex is formed by the inferior part of the symphysis pubis, the descending branch of this bone, the ascending branch and tuberosity of the ischium, the inferior margin of the great sacro-sciatic ligament, and by the border and point of the coccyx. Hence, three triangular projections are found in it: the two ischia upon the sides, and the coccyx behind. The first two are immovable, but the last, on the contrary, is effaced at the period of delivery, as just mentioned; for the mobility of the sacro-coccygeal articulation allows the coccyx to be pushed downwards and backwards by the fœtal head, as it traverses the inferior strait. The two lateral prominences, made by the tuberosities of the ischia, are placed on a plane somewhat lower than the point of the coccyx; and consequently, in the sitting posture, the weight of the body rests solely on those tuberosities, and not at all upon the coccygeal extremity. This circumstance furnishes us a reason why transverse contractions of the pelvis are far more frequent at the inferior strait than the antero-posterior ones.

The three notches also require a passing notice; thus, the two postero-lateral ones are very deep, but when the sciatic ligaments have been preserved, they are comparatively superficial; the third is found anteriorly; its apex corresponds to the inferior part of the symphysis pubis, its base to a line drawn between the anterior parts of the tuberosities of the ischia, and its sides are formed by the ischio-pubal *rami*. The term *arch of the pubis* has been applied to this notch. The columns of the arch are distorted outwardly, as if a rounded body had been forcibly expelled from the pelvis, whilst the bones were soft, and had pushed them before it; and this arrange-

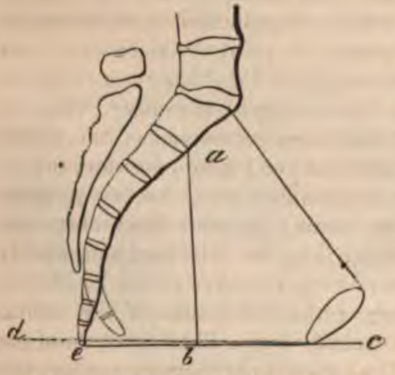
LANE LIBRARY

ment, which is more marked in the female than the male, favors the descent of the head. The arch is three and a half to three and three-quarter inches broad at the base; but only one and a quarter to one and a half inches at its apex; in height, it is about two, to two and a half inches. Hence the area of the inferior strait will not present a uniform plane (should it be desirable to ascertain the irregularities it exhibits), because all parts of its margin are not upon the same level. However, to obviate the difficulty met with, in determining the direction of this plane, Dugès has divided the strait into two nearly equal portions, the one anterior, and the other posterior, meeting at the tuberosities of the ischium, and each presenting a distinct plane and axis; but as this method of proceeding uselessly complicates the question, we prefer considering the terminal plane of the pelvis, as represented by the coccy-pubal line, thus leaving out the lateral projections altogether.

The question is then reduced to these terms: What is the direction of the line that extends from the point of the coccyx to the inferior part of the symphysis pubis?

Writers, likewise, variously describe this; for instance, according to the majority of the French accoucheurs, the plane of the inferior strait is slightly oblique, from below upwards, and from behind forwards, so that it would unite with that of the superior strait (if prolonged) in front of the symphysis pubis. On the other hand, M. Nægèle concludes, from his numerous researches, that the inclination of the antero-posterior diameter of this strait is from 10° to 11° from the horizon, and that the point of the coccyx is found, as a mean, from a half to three-quarters of an inch higher than the summit of the pubic arch; and, therefore, the coccy-pubal line is a little oblique from above downwards, and from behind forwards. The lower extremity of the axis of this plane of the inferior strait would cut the coccy-pubic diameter at right angles, and terminate above at the sacro-vertebral angle. As a further result of his labors, he has found that, in five hundred well-formed persons, of different statures, four hundred and fifty-four have the point of the coccyx more elevated than the inferior portion of the symphysis; in twenty-six it was lower, and in twenty individuals both points were on the same level. M. Velpeau remarks, as we think with some reason, that, at the moment of delivery,—the only time, after all, when it is requisite to form an idea of the direction of this plane,—the point of the coccyx, being pushed downwards and backwards by the passage of the head, is at least on a level with, if not lower than the inferior part of the symphysis.

Fig. 13.



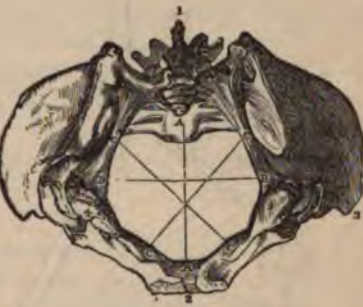
c d. The horizontal line. *c e.* The plane of the inferior strait (during labor). *a b.* The axis of the inferior strait.

The assertion of M. Nægèle, therefore, although true as applied to the female not in labor, fails during parturition; and it must be admitted that the plane of the inferior strait is then oblique from below upwards, and from behind forwards.

The axis of this strait is represented by a line (*a b*, Fig. 13) directed from above downwards, and from behind forwards, which, starting from the first piece of the sacrum, falls at a right angle upon the middle of the bis-ischiatic space. The remarks made upon the variations in the direction of the plane, apply with equal force to its axis. The latter crosses the axis of the superior strait in the excavation, forming with it an obtuse angle, the sine of which is in front.

It is also very important to know the dimensions of the perineal strait, and hence obstetricians describe three principal diameters at that point, namely—1. The antero-posterior or coccy-pubal diameter (*a a*, Fig. 14), running from the point of the coccyx to the summit of the pubic arch; it is usually four and a quarter inches long, but may increase to four and three-quarter inches during labor, by the retrocession of the coccyx. 2. The bis-ischiatic, or transverse diameter, *b b*, is four and a quarter inches in length, and goes from one tuberosity of the ischium to the other. 3. The oblique diameter, *c c*, commences at the middle of the great sacro-sciatic ligament, and crosses to the point of union of the ascending branch of the ischium, with the descending ramus of the pubis, and is four and a quarter inches long, but may become one-quarter of an inch more during labor, from the elasticity of these ligaments.

FIG. 14.



a a. The antero-posterior or coccy-pubal diameter. *b b*. The transverse or bis-ischiatic diameter. *c c*. The two oblique diameters.

All the diameters of the inferior strait are, therefore, in the dried pelvis, about four and a quarter inches in length, though their dimensions are susceptible of great variation during labor.

§ 5. OF THE EXCAVATION.

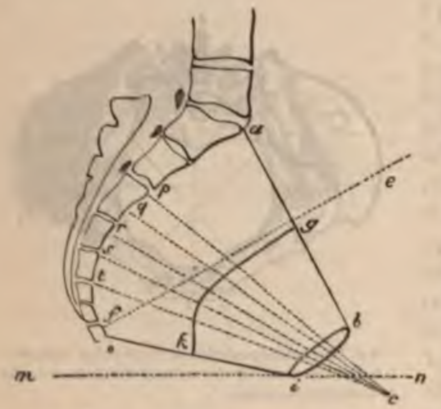
The excavation is that space comprised between the superior and the inferior straits, and it is in this cavity that the fœtal head executes its principal movements; and it is somewhat surprising, that, until quite recently, this canal was scarcely mentioned in the majority of the classic works, notwithstanding the importance of a knowledge of its dimensions, as also of the direction of its plane and axis.

Its dimensions comprise both the height and width at the different points: thus the height in front, is one and a half inches; upon the sides, three and three-quarter inches; whilst it is four and a quarter inches behind, if a straight line be drawn from the sacro-vertebral angle to the point of the coccyx, and five inches and a quarter, following the curve of the sacrum.

Three diameters are also described for this cavity (like the straits), so as to appreciate its extent in the different directions. All of them are taken at the centre of the excavation, and they consist of an antero-posterior one, of four and three-quarters to five and one-eighth inches in length, a transverse diameter four and three-quarter inches long, and an oblique one, of the same length; consequently, all the diameters of this cavity are very nearly four and three-quarter inches each.

If the canal forming the excavation were a cylinder, it would only be necessary to divide it by a plane, perpendicular to its walls, in order to represent the opening of this cavity; but a simple division, thus made, would not give a just conception of the excavation, for two reasons. First, the canal is not cylindrical, because its sides are not parallel, and the anterior face of the sacrum presents a well-marked curvature; the pubic wall being nearly straight, and the lateral parietes very oblique from without inwards, and from above downwards. Consequently, to furnish an exact idea of the general arrangement of the pelvic excavation, it seems necessary to divide the canal (see Fig. 15) by a series of planes, all passing from the point *c* (the point of intersection of the planes of the superior and inferior straits) to any point whatever, *p q r s t*, on the anterior face of the sacrum. Each of these planes will show the opening of the pelvic cavity at the level where it is found. Now, to determine, with certainty, the direction of the general axis of this excavation, it is requisite to raise a perpendicular line from the geometrical centre of each of these sections, and to draw a line *g k* through the base of each.

Fig. 15.



a b. The plane of the superior strait. *i d.* The plane of the inferior strait. *c.* The point where these two planes would meet, if prolonged. *m n.* The horizontal line. *e f.* The axis of the superior strait. *g k.* The axis of the excavation. *p q r s t.* Various points taken on the sacrum to show the plane of the excavation at each point.

This line *g k* (which, as the student will observe, is not straight) is called the general axis of the pelvis.

It is now readily understood that this line is nearly parallel to the anterior face of the sacrum, and its extremities correspond with the axes of the superior and the inferior straits; hence, this curve exactly represents the whole axis of the pelvis, or, in other words, the line which the fœtus must follow in traversing the pelvic excavation.

It would be wrong to consider the line, representing the entire axis of the excavation, as a simple curve; for M. Nægèle has well observed, that it cannot be composed of two straight lines, as often taught, nor is it a simple arc of a circle. In fact, the anterior face of the bodies of the first two bones of the sacrum forms a straight line; the sacral curve embracing only the last three bones. Consequently, the central line, which is evidently parallel to this, will consist of a straight and a curved portion—straight, for that part of the excavation corresponding to the two superior vertebræ, and curved in the space, which is bounded behind by the last three sacral vertebræ, and in front by the anterior pelvic walls.

§ 6. Base of the Pelvis.

The base of the cone, represented by the pelvis, has its circumference directed upwards and in front; it exhibits, behind, a notch, into the bottom of which the base of the sacrum projects, and which is further filled up by the last lumbar vertebræ (generally left *in situ* to complete the posterior wall of the greater pelvis), by the ilio-lumbar ligaments, and by the quadratus lumborum muscles; 2, outwardly, the anterior two-thirds of the iliac crest furnishing attachments to the external and the internal oblique and transversalis abdominis muscles; and 3, in front, the anterior superior and inferior spinous processes of the ilium, the groove for the passage of the conjoint muscles—the psoas magnus and iliacus internus, the ilio-pectineal eminence, the superior border of the horizontal branch of the pubis, the spine, and lastly, the upper margin of the symphysis of this bone.

§ 7. Differences of the Pelvis.

1. According to the *sex*. Considered as a whole, the pelvis in the male is smaller but deeper, the bones are thicker, and the muscular impressions more marked, than in the female. The superior strait being more retracted, resembles the figure of a heart on a playing-card. The excavation is not so wide, though it is deeper, especially in front, owing to the greater length of the symphysis pubis; the arch of the pubis is straight, nearly triangular in shape, and is not widened in front. The coccyx is early joined to the sacrum, and the articulations of the pelvis are much sooner anchylosed than in the female. In the latter, we may add, that the iliac fossæ are larger and more warped outwardly (whence the prominence of the haunch bones), and the iliac crest less twisted in the form of an italic *f;* the interval separating the angle of the pubis from the cotyloid cavity is more considerable, causing, in part, the projection of the great trochanters, and a wider separation of the femurs; the superior strait is larger and more elliptical; the curve of the sacrum deeper and more regular; the tuberosities of the ischium are farther apart; the pubic symphysis shorter; the foramen thyroideum more triangular; the arch of the pubis broader, more rounded, and more curved, and the lateral borders, formed by the ischio-pubic ramus, more contorted outwardly.

2. According to the *age*. At birth, the pelvis is extremely narrow and elongated, and of such inconsiderable dimensions, that its cavity will not contain several of the organs afterwards found in it; from which circumstance, the protuberance of the belly, observed in the fœtus and in children at term, in great measure results; the excavation has the form of a cone, the abdominal strait being strongly inclined downwards; the sacrum is

nearly flat, and so much elevated that a horizontal line drawn from the superior part of the pubis would pass beneath the coccyx; the coxal bones are narrow, elongated, and nearly straight at their superior part, and the cartilaginous iliac crests are not twisted.

From this disposition it necessarily happens that the greatest diameter of the pelvis extends from the sacrum to the pubis. Burns declares that this form changes by degrees as the little girl advances in age: thus, the—

	At 9 years.	At 10 years.	At 13 years.	At 14 years.	At 18 years.
Antero-posterior diameter measures .	2⅞ inches.	3¼ inches.	3¼ inches.	3¾ inches.	3⅞ inches.
Transverse diameter measures, . . .	2¾ inches.	3 in. 5 lines.	3¾ inches.	4 inches.	4½ inches.

[3. According to *Races*. This subject, studied by Vrolick and Dubois, has been recently taken up by Joulin, who published an important memoir on it, in which he proves that there is nothing characteristic in the differences to be observed in the pelves of the three races, Aryan, Negro, and Mongol; in the two latter especially, the resemblance is so strong that it is impossible to distinguish them. The same author states that, contrary to what has been said, in all human races the transverse diameter of the superior strait is greater than the antero-posterior; but that the oblique diameter of the superior strait of the pelvis of the Negress and Mongol female differs from the transverse by a few millimeters only, whilst in the Aryan female the difference amounts to a centimetre and a half. The pelves of the Negro and Mongol are, besides, less capacious than those of the white race; they have less depth, and the pubic arch is wider by several degrees.]

§ 8. USES OF THE PELVIS.

The pelvis constitutes the base of the trunk, and, according to Desormeaux, it forms a complete ring, that may be reduced to two arches; the posterior and superior of which receives the whole weight of the trunk, whilst the anterior and inferior one serves as a buttress to it.

The two lower extremities are attached to the lateral parts of this circle, and support, in the erect posture, all the weight of the superior part of the body. This use of the pelvis satisfactorily explains to the accoucheur the vicious forms the cavity often assumes when ossification is retarded, or whenever any disease alters and softens the bones.

Another function of the pelvis is to inclose and protect the bladder, rectum, and seminal vesicles of the male; the uterus, Fallopian tubes, and ovaries in the female. During gestation, it sustains and gives a proper direction to the womb; and in labor, it affords a passage to the child.

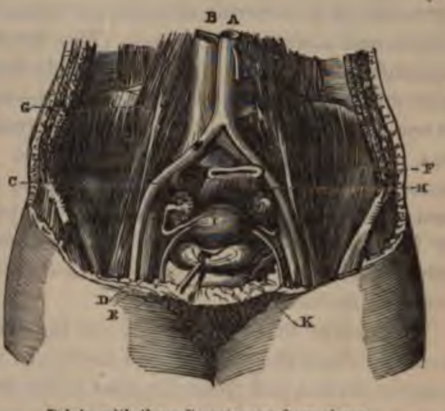
ARTICLE IV.

OF THE PELVIS, COVERED BY THE SOFT PARTS.

It will not suffice to study the pelvis as found in the skeleton alone, for the changes produced in its form and dimensions in the living female, by the arrangement of the soft parts, also require our special attention.

Being continuous above with the abdomen, the great pelvis incloses and supports the mass of the intestines, and affords points of attachment by its walls to two orders of muscles. The one destined to form the inclosure of the belly fills the large opening exhibited in front, and thus constitutes the anterior abdominal wall; the extensibility of which, in comparison with the resistance of the posterior plane, accounts readily for the tendency of the uterus to incline forward in the advanced stage of gestation. The others, two in number, are placed in the iliac fossæ; they are the iliacus internus, and the psoas magnus muscles, which, from being situated on the lateral parts of the abdominal strait, change both its form and dimensions. The first of these has radiated fibres, and occupies the iliac fossæ; the second descends from the sides of the lumbar vertebræ, and after having been joined to the preceding, is inserted into the lesser trochanter of the thigh bone. These two muscles, surrounded and confined by an aponeurosis (*fascia iliaca*), may be regarded as a sort of cushion, forming a convenient support to the developed uterus, and destined to protect it by the elasticity of the soft parts against the shocks and concussions continually produced by locomotion. Notwithstanding the presence of these muscles, the strait still resembles a curvilinear triangle in shape, the base, however, of the triangle being in front instead of behind, as it was in the dried pelvis; the transverse diameter is diminished half an inch by their presence; the antero-posterior one is, perhaps, a little abridged by the thickness of the vesical walls, uterus and soft parts that line the posterior face of the symphysis and anterior surface of the sacrum, the oblique diameters alone remaining unchanged; the location of the rectum, however, on the left, shortens slightly the corresponding diameter.

Fig. 16.



Pelvis, with the soft parts seen from above.

A. A section of the aorta. B. The vena cava inferior. C. The internal iliac artery, arising together with D, the external iliac, from the primitive iliac trunk. E. External iliac vein. F. The iliacus internus, and G, the psoas magnus muscles. H. The rectum. I. The uterus with its appendages. K. The bladder, the fundus of which is depressed so as to bring the womb into view.

The modification of the transverse diameter, produced by the psoas muscles, is always much less when these are in a state of relaxation from the flexure of the thighs. Finally, as Baudelocque has remarked, the bis-iliac diameter is diminished in length, in proportion to the thickness of these muscles, and the antero-posterior one being more contracted, the strait becomes more elliptic or rounded. Two muscles are also found on each side of the excavation, covering the obturator and ischiatic foramina; namely, the obturator internus, and the pyramidales. Flamand attributes the movements of rotation, executed by the head in the pelvis, to the action of these muscles; but the same reasons that caused us to reject the influence of the inclined planes on this process, equally deter us from entertaining the opinion of the Strasburg Professor. The pelvic cavity is still further diminished by the rectum, bladder, and cellular tissue; more especially when the latter is loaded with fat. Consequently, the fœtal head descends with more difficulty in very corpulent women than in others.

The perineal strait, although open in the dried skeleton, is here occupied by a sort of contractile concave partition, which sustains the viscera of the pelvic and abdominal cavities. This floor, so to speak, is composed of two muscular planes; the interior of which, formed by the levator ani and coccygeal muscles, is concave above; and the other, having its concavity below, is constituted by the sphincter ani, the transversus perinei, the ischio-cavernous, and the constrictor vaginæ muscles. The internal pudic vessels and nerves, a large amount of cellular tissue, the skin, the pelvic aponeurosis, and an inter-muscular aponeurosis complete this floor, which, in the hour of labor, ought to become thin and distended, but which occasionally offers such an obstacle to the spontaneous delivery of the fœtus as to require the intervention of art.

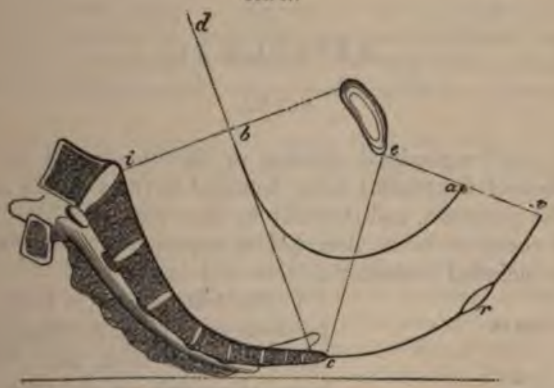
The extent of the perineum, in its ordinary condition, is three inches, namely: from the point of the coccyx to the anus, there are one and three-quarter inches, and from the anus to the vulva, one and one-quarter inches; but at the instant of the passage of the head through the genital fissure it becomes so distended, that the interval separating the anterior commissure from the coccyx, is increased from four to four and three-quarter inches.

It must now be evident that the terminal outlet of the pelvic canal, in the pelvis, covered with its soft parts, is not at the point of the coccyx, but rather at the anterior commissure of the perineum; in fact, the latter is so greatly distended in the last moments of labor, that its anterior border goes beyond the inferior part of the symphysis pubis, thereby prolonging very considerably the posterior wall of the pelvic excavation, and, as a consequence, the canal to be traversed by the fœtus. Wherefore, the direction in which the head is ultimately disengaged is not represented by the axis of the inferior strait, but by that of a plane which may be drawn from the lower part of the symphysis to the anterior commissure of the distended perineum.

Hence, in order to form an exact idea of the line traversed by the fœtus, from its entrance into the superior strait until its final exit from the vulva, it will be necessary to continue the operation already pursued upon the anterior face of the sacrum (see page 52) over the curve represented by the anterior face of the distended perineum: that is, to make a series of planes from the point *c* (Fig. 15) to the divers parts of the perineal curve; and, from the centre of each, raise a perpendicular, so as to form by their union a complete axis, the upper extremity of which is the axis of the superior strait; the middle part, a curved line, having its concavity anterior and its convexity parallel to the front face of the sacrum and perineum, and the inferior extremity directed from before backwards, and slightly from above downwards.

It must not, however, be forgotten, that the direction just described belongs to the vertical posture, and that it becomes remarkably altered in the various attitudes assumed by the female. Thus, whilst lying upon the back, as is usual in France during labor, the plane of the superior strait instead of looking upward and forward will be turned upward and backward, and its axis directed from above downward and from behind forward. At the same time, the plane of the inferior strait, which before looked backward and downward, will be turned almost directly forward, its axis also passing directly from before backward. Finally, the terminal orifice formed by the contour of the vulva presents another plane, which at the moment of delivery (the horizontal position being still maintained) is directed upward and forward. In short, the central line followed by the fœtus during its expulsion is a strongly-marked curve, whose concavity is turned almost directly upward (Fig. 17).

FIG. 17.



Position of the pelvis and the direction of its axis in the dorsal attitude assumed by the female during labor.

a b. Total axis of the excavation, being a continuation of *d b*, the axis of the superior strait. *c v*. Perineum as distended at the moment of the passage of the head. *r*. Anal orifice. *e v*. Terminal plane of the pelvis.

CHAPTER II.

OF THE EXTERNAL ORGANS OF GENERATION.

THE genital apparatus of the female is much more complicated than that of the male, and is composed of organs situated in the interior of the pelvis, and of parts attached to its exterior. The former are the ovaries, Fallopian tubes, uterus, and vagina, and the latter, the mons veneris, vulva, and perineum. We commence by describing the external organs of generation.

ARTICLE I.

MONS VENERIS.

The *mons veneris* is a rounded eminence, a species of *relief*, more or less prominent according to the embonpoint of the individual, situated in front of the pubis, and surmounting the vulva; this eminence is partly produced by the bones, and partly by the subcutaneous adipose tissue; the skin covering it is very thick and elastic, but being little extensible, it cannot aid in the enlargement of the vulva, as asserted by M. Moreau, at the period of delivery. In the adult female, it is covered with hair, and contains a great number of sebaceous follicles.

ARTICLE II.

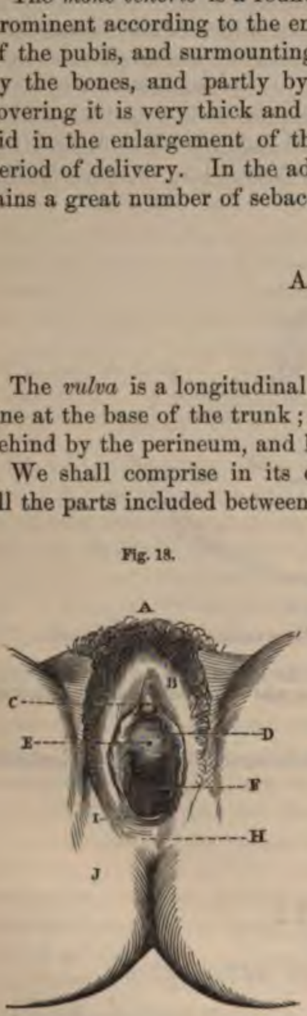
VULVA.

The *vulva* is a longitudinal opening or fissure, situated on the median line at the base of the trunk; being bounded in front by the mons veneris, behind by the perineum, and laterally by the external labia.

We shall comprise in its description, as properly appertaining thereto, all the parts included between the labia majora.

1. The *labia majora*, or labia externa, are two cutaneous folds, flattened transversely, and thicker in front than behind, which bound the opening of the vulva externally; commencing at the mons veneris, they gradually recede from each other, as they pass backwards, nearly to their middle, where they again approach, so as to unite at the posterior extremity, and form there a bridle or commissure called the *fourchette*, which is generally lacerated during the first labor.

Fig. 18.



External genital parts.

A. Mons veneris. B. Labia majora. C. Clitoris. D. Labia minora. E. Orifice of urethra. F. Orifice of vagina. H. Posterior commissure of the vulva. I. Perineum. J. Anus.

The labia externa present an external or cutaneous surface, which is covered with hair after puberty; and an internal one, moist, smooth, of a rose color, and formed by a mucous membrane that is provided with a considerable quantity of sebaceous glands and papillæ.

In young girls, the external lips are somewhat thicker above, and approach each other closely; but in females who have borne children they are separated, and have lost their regularity.

They consist of a cutaneous and a mucous layer, between which is a fibrous partition, a continuation of the superficial fascia of the perineum. Between this aponeurosis and the internal surface of the integument, is found a very thick layer of cellulo-adipose tissue, filling up a peculiar pouch hitherto unknown to anatomists until discovered by M. Broca.

[This pouch is constituted by a membranous sac situated between the skin and the superficial aponeurosis: its bottom is directed towards the fourchette, where it becomes blended with the fascia superficialis of the parts on each side of the anus. It has a long and narrow neck, which is directed toward the external inguinal ring, and receives into its opening a portion of the fibres of the round ligament. Its cavity is filled with cellulo-adipose tissue, varying in quantity with the embonpoint of the individual. The pouch forms of itself the greater part of the thickness of the labia majora.

The fibres of which the pouch is composed are derived chiefly from the fascia superficialis of the thigh and abdomen, but some proceed directly from the spine of the pubis; the most external are attached to the rami of the pubes and ischia, whilst the most internal unite and become blended with the suspensory ligament of the clitoris.

According to M. Broca, this sac is the analogue of the dartos of the male; M. Sappey, however, believes that it is comparable only to the suspensory ligament of the scrotum and penis. The microscope proves it to be composed of interlaced fibres of elastic tissue.

The arteries of the labia majora are derived from the perineal artery, itself a branch of the internal pudic or of the external pudic or epigastric.

The veins for the most part accompany the arteries, some, however, pass backward and form a plexus, which communicates with the bulb and vaginal veins. These veins, which are very numerous, often become dilated during pregnancy.

The nerves proceed from the genito-crural branch of the lumbar plexus, and from the perineal branch of the internal pudic nerve. The lymphatics all pass into the inguinal glands.]

2. The *nymphæ*, or *labia interna*, are brought into view, by separating the external lips, under the form of two mucous folds, resembling the comb of a young cock. Contracted behind, where they are continuous with the internal face of the labia externa, they spread out in front as they converge towards each other. These lips scarcely descend to the middle of the external ones, but they mount up in front as high as the clitoris, where they bifurcate; the inferior branch of this bifurcation is lost in the clitoris; but the other surmounts it, joins its fellow of the opposite side, and forms above this body a little fold in the shape of a hood, called the *prepuce of the clitoris*. At birth, the nymphæ project beyond the external lips, but at puberty they are concealed by the latter. Again, they become visible in child-bearing women; rather, however, by the separation of the labia majora than by their own prominence.

Further, their dimensions are very variable in different individuals, and in various climates; thus, in certain countries of Africa, they are very long, and constitute the famous *apron* of the Hottentots. Besides, as Velpeau has remarked, these parts are so extensible that, under the influence of continual tractions, they may become very much elongated. I have met with a young female, in my own practice, who was afflicted with an excessive itching at the vulva at the commencement of her pregnancy. To relieve this, she was in the habit of scratching continually, and in her impatience dragged on the right nympha, so that, in less than a fortnight, it had become twice as long as its fellow.

[The internal labia are covered with tesselated epithelium, below which are papillæ whose sensibility is especially exercised during copulation. The papillæ of the internal surface have a greater development than those of the external surface, and their size is found to increase as they approach the orifice of the vagina.

The blood-vessels of the internal labia are supplied by those of the labia majora. A portion of the veins anastomose largely with those of the bulb and of the vagina.

The nerves come from the perineal branch. The lymphatics proceed to the inguinal glands.]

3. *The Clitoris.*—Under this name, a little erectile tubercle, resembling the corpus cavernosum of the male (except in volume), is described. Its free extremity appears at the front part of the vulva, about half an inch behind the anterior commissure of the labia externa, and its body is attached by two crura to ischio-pubic rami; these roots ascend, converging and increasing in size, to the level of the symphysis, where they unite to form a single cavernous body, flattened on its sides, which after a course of two or three lines in front of the symphysis, becomes detached and curved forward so as to present a convexity above and in front, at the same time growing more and more slender towards the free extremity, which is called the *glans clitoridis.*

During the first months of the intra-uterine life it is difficult to make out the distinction of the sexes, because the clitoris is as long as the penis; even in the earlier years of existence its dimensions are quite considerable, but after this period it ceases to grow, and, in some females, apparently diminishes. Again, in certain rare cases, it acquires a great length; for instance, M. Cruveilhier has seen one whose free extremity measured two inches, and a case is on record where it reached from four and a quarter to five inches. Most of the pretended hermaphrodites may be referred to anomalies of this kind.

Henle gives a representation of a case so singular and rare as to deserve mention. It is a congenital division of the clitoris occurring in a girl of seventeen years of age, in which the body of that organ was completely divided through the middle so as to form two nipples, each invested with a prepuce. The halves of the prepuce thus divided, are prolonged respectively toward the corresponding nympha, from which it is separated by a notch, and is lost, above, in the frenum clitoridis.

The clitoris, like the penis, has a suspensory ligament, and an erector muscle; the canal of the urethra in the female passes between the two branches of the cavernous body, as it does in the male.

[The structure of the clitoris is, in all respects, precisely that of the corpus cavernosum of the male, except in point of size. It presents the fibrous envelope, the muscular trabeculæ, and the helicine arteries, all characteristic of the erectile tissue. During coition, blood accumulates in it, dilates it, and thereby causes its erection.

The arteries of the clitoris come from the perineal artery, and are distributed as in the male, presenting therefore the cavernous artery, which on each side enters the corresponding corpus cavernosum, and the dorsal artery, which is distributed to the mucous membrane known as the prepuce of the clitoris.

The veins form a plexus arranged in two planes, the most superficial of which furnishes the dorsal vein, whilst the deeper communicates with the veins of the bulb, of the vagina, and of the bladder.

The nerves proceed from the perineal branch of the internal pudic; they send branches to the corpus cavernosum, and terminate in the prepuce, which is the principal seat of voluptuousness in the female.]

4. The *vestibule* is a small triangular space placed at the upper part of the vulva. It is bounded above by the clitoris, below by the urethra, and laterally by the nymphæ.

5. *The Urethra.* — The meatus urinarius is situated just below the vestibule, about an inch from the clitoris, and immediately above the prominent enlargement of the anterior part of the vagina. The orifice is usually more contracted than the canal, but the tubercle or enlargement just alluded to, enables us to sound females without uncovering them, for it is only necessary to recognize it by the finger in order to direct the instrument properly. In my estimation, the following is the most simple method of introducing the catheter without uncovering the patient; I first introduce my finger into the orifice of the vagina, and rest its palmar face against the anterior vaginal wall; I then slide the instrument along this palmar face until it is arrested by the fold already alluded to; then I depress the extremity so as to elevate the point of the instrument one or two lines, and in the majority of cases, the canal is easily entered in this manner.

[If the first attempt should fail, it may be tried again in another way. The point of the forefinger finds the clitoris, and passes from above downwards to the middle of the vestibule; the first inequality met with is the orifice of the urethra, into which the instrument can then be inserted. I have often succeeded in this way, after having failed by the ordinary method.

In some women, those especially who have borne children, the parts adjoining the meatus are so deformed, that it becomes absolutely necessary to expose the parts in order to introduce the catheter; even then it is by no means easily done, and I have seen the most skilful foiled in attempting it. It may be accomplished with certainty by separating carefully the greater and lesser labia, and then sliding the extremity of the catheter from above downward along the median line of the vestibule below the clitoris, which is the chief rallying point. During this movement the instrument falls, so to speak, of its own accord into the orifice of the urethra; but if slid either to the right or left, it will be sure to go astray. We shall learn hereafter (article *Pregnancy*) the cause of the difficulties met with in catheterizing pregnant women.]

The urethra, a continuation of the meatus urinarius, just described, varies in the female from one to one and a half inches in length. It is large, conical, and slightly curved. Its inferior portion is confounded with, or at least intimately united to, the anterior vaginal wall, and its anterior parietes, separated in front from the pubis by some cellular tissue only, is located on a level with the symphysis, under the junction of the two crura of the clitoris.

The canal of the urethra is muscular and erectile, having a thick lamina of muscular fibres, which seem to be a continuation of those of the bladder; another thick layer formed by a venous plexus, lies subjacent to the mucous membrane.

Occasionally, this canal is enormously dilated. Flamand met with a case that permitted the introduction of the finger, and Meyer, with another, which eventually admitted of coition!

6. *The Hymen.*—The irregular opening of the vagina is found beneath the meatus urinarius; it is of variable dimensions after coition, and in females who have had children; but in virgins, it is provided with a membrane by which the orifice is diminished. This membrane is the *hymen*, a species of diaphragm, interposed between the internal organs and the external genital apparatus and the urinary passages. It resembles a crescent in shape (Fig. 19), the concavity being anterior; sometimes the horns of the crescent are prolonged enough to join each other, thus forming a complete circle, perforated in the centre (Fig. 20); its free margin is thin and concave; the convex one is continuous with the membrane of the vagina or vulva, and as this blocks up the posterior and lateral parts of the vagina, a notable difference will exist in the extent of the orifice, dependent upon the greater or less size of the hymen.

Sometimes the hymen forms a complete imperforate membrane. Though often thin, transparent, and very fragile, it is occasionally found thick and resisting.

FIG. 19.

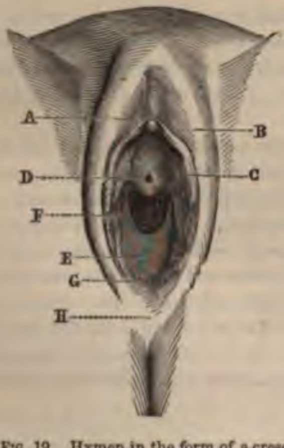


FIG. 20.

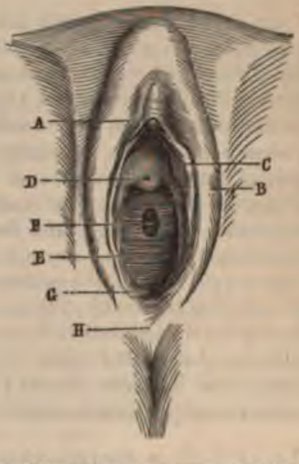


FIG. 19. Hymen in the form of a crescent.

A. Clitoris. B. Labia externa. C. Labia interna. D. Orifice of the urethra. E. Hymen. F. Orifice of the vagina. G. Posterior commissure of the vulva.

FIG. 20. This figure exhibits the hymen in the form of a circle. E. The hymen. F. The central opening somewhat elongated.

The two forms just mentioned are not the only ones which the hymen may assume; other varieties have been described by M. Velpeau, as follows: 1. In the semicircular species, the hymen may form such a narrow and solid fold as to permit copulation without being ruptured. 2. In the crescentic variety (Fig. 19) the concave border approaches more or less towards the urethra, in such a way as to contract the vagina behind, and hence it almost always gives way in coition. 3. In the circular variety, the free border is much thinner than the other (Fig. 20), often being fringed, as it were, and leaving an opening which is sometimes round, sometimes slightly elongated, though in general situated somewhat nearer to the anterior than the posterior wall of the vagina. 4. Again, we find a disk or complete diaphragm, that is ordinarily pierced by a number of small holes like those of a watering-pot, and at other times is without the least aperture. 5. In some instances a species of bridle, or a small cord attached under the urethra, or on the concave border of the hymen, supplants both the valve and the circle. 6. Lastly, a second hymen occasionally exists above the first.

[Full details of the anatomy of this membrane may be found in the thesis of M. Ledru, defended before the Faculty of Medicine, Paris, 1855.

The hymen is formed by a fold of the vaginal mucous membrane, between the layers of which are cellular tissue fibres, some muscular fibres, vessels, and nerve filaments.]

This membrane is regarded as the seal of virginity; and yet, as just shown, it is often found after a fecundation; and, on the other hand, numerous causes besides coition may destroy it. It is generally ruptured at the first sexual approaches, and of its debris are formed two or three little tubercles, bearing the name of *carunculæ myrtiformes*.

The hymen is composed of a fold of mucous membrane, containing between its laminæ a few vessels and some areolar tissue.

7. The *carunculæ myrtiformes* are some little tubercles, two to five in number, which appear to be the debris of the ruptured hymen; the two most anterior ones, according to certain physiologists, appertain to the median columns of the vagina.

In consequence of oft-repeated friction, these caruncles may inflame, degenerate, and even become the source of an abundant purulent discharge; they have been mistaken under such circumstances for syphilitic vegetations, and the patient subjected to anti-venereal treatment, which, at least, was useless. Personal cleanliness, and some of the vegeto-mineral lotions are usually sufficient to cause their disappearance. M. Velpeau has resorted, however, in some cases, to excision.

8. *Fossa Navicularis.*—This is a little depression, of half an inch only in extent, bounded behind by the fourchette, and in front by the convex border of the hymen. It, like the fourchette, formed, as before stated, by the junction of the inferior extremities of the labia majora, mostly disappears after delivery.

ARTICLE III.

OF THE SECRETORY APPARATUS OF THE EXTERNAL ORGANS OF GENERATION.

[The secretory apparatus of the female genital organs has been the subject of numerous investigations, but of late a fresh interest in the subject has given rise to works by Robert, Huguier, Sappey, Martin, and Léger, all of which are placed under contribution in the preparation of this article.

Aside from the piliferous bulbs, the glands of the vulva may be arranged in three classes: 1. Sudoriparous glands; 2. Sebaceous glands; 3. Muciparous glands and follicles.

First class. — The *sudoriparous glands* are found on the penil and the external surface of the labia majora; they are mingled with the sebaceous glands and surround the bases of the hair bulbs. Presenting the same arrangement as in other parts of the body, they are noticeable here on account of their great number.

Second class. — The *sebaceous glands* of the vulva are extremely numerous. Those of the mons veneris and of the outer surface of the labia majora are remarkable for their size, having an average diameter of $\frac{4}{100}$ of an inch. They are generally composed of from four to six lobules, each containing eight or ten *culs-de-sac.* They always open upon a piliferous bulb.

The internal surfaces of the labia majora are also provided with sebaceous glands to the extent of about forty to every $\frac{2}{5}$ of an inch square. They are still more numerous upon both sides of the lesser labia, the inner surfaces of which present about one hundred and fifty to every $\frac{2}{5}$ of an inch square. Martin and Léger note the fact, that these glands, which are very apparent in the adult female, become atrophied after the cessation of the menstrual function, and cannot be found at all in the fœtus.

The sebaceous glands are also found on the fourchette and the prepuce of the clitoris. No trace of them, however, is to be discovered either in the vestibule or around the orifice of the urethra.

These glands secrete an oily matter, which maintains the suppleness of the parts to which it is applied, prevents them from contracting abnormal adhesions, and preserves them from irritation by the urine.

Third class. — The muciparous follicles as described by M. Huguier, present two varieties: in the first, they are isolated or simply agminated, *isolated* or *agminated follicles;* in the second they are enclosed in one envelope, and discharge into the same excretory canal, *vulvo-vaginal glands.*

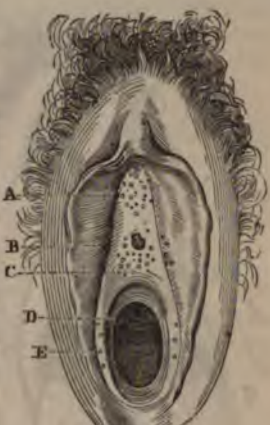
A. *Isolated* or *agminated muciparous follicles.* These follicles exist, according to Huguier, upon several points of the circumference of the vaginal orifice; they are sometimes absent and always difficult to discover; their existence even has been denied by some anatomists (Sappey, Martin, Léger). Huguier describes three groups of them.

1. — Eight or ten of them are found in the vestibule below the clitoris, where they open by separate orifices, which are very small and partly covered by a root of valve easily raised by a probe; (*Vestibular* follicles of Huguier) (fig. 21, A). These follicles are mere depressions in the mucous membrane without a diverticulum. So simple is their structure, that Martin and Léger refused to call them *muciparous follicles.*]

2. Others, termed *urethral follicles* on account of their situation, are stated by M. Huguier to be less readily discoverable than the preceding, on which account they were supposed by M. Robert to be less numerous. They are

of considerable size, and are situated at a depth of from three-eighths to four-eighths of an inch in the cellulo-vascular tissue of the urethra (Fig. 21, C). They are placed beneath the mucous membrane in a direction parallel to the canal, and discharge in close proximity to the orifice of the urethra upon the surface of the projection which forms the inferior boundary of that opening in such a way as to form a semicircle, or sometimes even an entire circle, around it. They are closer together than those which have been just described, and sometimes several of them open into the same excretory cavity, so as to produce the ramified arrangement which Graaf has figured and described.

Fig. 21.



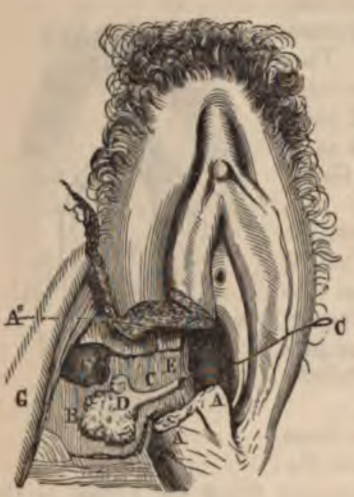
3. Laterally, and at some distance from the urethral orifice, are several small and shallow ones, with a common opening at the bottom of a remarkable conical depression. M. Huguier states that these are often absent, and he proposes calling them the *lateral urethral follicles* (Fig. 21, B).

4. Besides these, some two, three, or four large follicles are found in some females upon the lateral parts of the vaginal orifice, immediately below the hymen or the upper carunculæ myrtiformes (Fig. 21, D); they are the *lateral follicles of the orifice of the vagina*. Their openings ordinarily correspond neither in number, situation, nor arrangement, with those of the opposite side; some are slightly projecting whilst others are not so, and some are readily visible whilst others are hidden beneath the myrtiform caruncles.

B. *Vulvo-vaginal gland.*—This gland had been completely lost sight of by modern anatomists, although described by Gaspar Bartholin; and attention has only recently been called to it by M. Huguier. It belongs to the class of conglomerate glands. There are two vulvo-vaginal glands, one on each side, where they form peculiar bodies whose position it is important to define with exactness. They are situated at the limits of the vulva and vagina, upon the lateral and posterior parts of the latter, about three-eighths of an inch above the upper surface of the hymen or of the myrtiform caruncles, in the triangular space formed on each side by the juxtaposition of the rectum and vagina, upon the latter of which they repose. They lie at a distance of from three-eighths to five-eighths of an inch from the internal surface of the ascending rami of the ischia, and from three-quarters of an inch to one and a quarter inches from the external labia.

The vulvo-vaginal gland has somewhat the shape of an apricot-kernel, resembling in this respect the lachrymal gland; like the latter, its two surfaces are flattened, and it is besides slightly lobular and mamelonated. According to M. Huguier, it is much flatter in women who have borne children, which he attributes to the species of separation which its granular elements must undergo from the enormous distention of the vulva during labor. The gland of the right side does not always resemble that of the left; it is indeed not uncommon to find one much more developed than the other.

FIG. 22.



Vulvo-vaginal Gland.

A A. Section of the labia majora and of the nymphæ, showing the excretory duct and its orifice. B. The gland. C. Excretory duct. C′. Stylet engaged in the orifice of the excretory duct. D. Its glandular extremity. E. Its vulvar extremity and orifice. F. Bulb of the vagina. G. Ascending ramus of the ischium.

Its size varies much according to age, habits, and, adds M. Huguier, according to the development of the ovaries, which appear to exercise a decided influence over it; for he has always found the largest gland upon the same side with the most voluminous ovary. It also appears larger in females who indulge immoderately in sexual pleasures. Its size is greatest, in general, between the ages of sixteen and thirty-five years. Its diameter at this period of life is, on an average, from four-eighths to five-eighths of an inch. It is very small at puberty, and becomes atrophied in old age.

Excretory Duct.—Each of the granules of which the gland is composed, is furnished with a minute duct, which, by uniting with those of the neighboring granules, gives rise to three separate ducts. The latter soon join to form a single canal, which proceeds from the internal surface and vulvar extremity of the gland (Fig. 22, D), and opens in virgins, or in females in whom the hymen has been only dilated, in the internal angle which the great circumference of this membrane forms by its union with the contour of the vulvar opening, and, when the hymen has been ruptured, at the base of the lateral and posterior myrtiform caruncles (Fig. 22, E). The orifice, which is smaller than the duct which it terminates, is in most women surrounded by a vascular area, which serves, by its lively red color, to distinguish it from the neighboring parts. If required, it will only be necessary to turn the caruncle inward in order to render it conspicuous: it should however be distinguished from three or four minute openings found in the same furrow, and which belong to the lateral follicles of the orifice of the vagina.

The direction of the opening of the duct is perpendicular, but its oblique orifice is directed upwards and inwards. Its external semi-circumference is provided with a small falciform, valvular fold of mucous membrane, which increases the difficulty of its detection. In the normal condition the diameter of the orifice hardly exceeds the one-one-hundreth of an inch.

The diameter of the duct varies from the one-twenty-fourth to the one-eighth of an inch, and its length, which lessens as the gland is more voluminous and approaches near the myrtiform caruncles, is, on an average, about five-eighths of an inch.

Organization.—The tissue proper, or glandular tissue, is of a yellowish-white color, and, when examined by a magnifier, or even by the naked eye, appears composed of lobules, themselves formed of granulations having a rounded and hollow appearance. The entire mass is surrounded by a fibro-cellular envelope, the thickness and transparency of which varies in different individuals. From the internal surface of the envelope are sent off a great number of fibrous prolongations which serve both to connect and separate the granules of the organs.

These glands are provided with arteries, veins, lymphatic vessels, and nerves. The arteries, two in number, are derived from the clitoric branch of the internal pudic; one of them is sometimes given off directly from the trunk of the latter. The veins, which form a sort of plexus upon the surface of the organ, empty partly into the pudic veins, and partly into the venous plexus of the vagina and the bulb.

The lymphatic vessels proceed to the lymphatic ganglions found in the cellular triangle included between the lateral parts of the vagina and the rectum and not into the inguinal glands.

The nerves are derived from the deep branch of the perineo-vulvar branch of the internal pudic.

When the glands are incised, they are found to contain a glutinous, thick, and unctuous fluid, which is generally colorless, transparent, or slightly turbid. In some cases it is brownish or of a deep chestnut color, which appearance is due to altered blood-corpuscles.

Uses and Functions.—The vulvo-vaginal gland, like the entire generative apparatus of which it forms a part, acquires its full development only at puberty. This concordance alone, independently of observation, would lead to the supposition that the fluid which it secretes is destined to bear a part in the generative act.

The amount of its secretion is, in fact, variable. It is especially increased during sexual intercourse, illicit contacts, and under the influence of lascivious thoughts, desires, and dreams. When, during coition, the muscles of the perineum and vulva are excited to involuntary and convulsive contractions, it is expelled in an intermittent manner or by jets, as is the sperm in the ejaculation of the male. According to M. Huguier, the use of this abundant secretion is to lubricate the external parts, and thus render the first approaches less painful, to maintain the humidity of the organs during the act, and thereby preserve their extreme sensibility.

ARTICLE IV.

PERINEUM.

9. The *perineum* is a sort of bridge, scarcely an inch to an inch and a half long, which separates the vulva from the anus; its inferior plane is composed of the skin. But, for a more full description of the parts entering into its structure, I must refer to the treatises on anatomy. (See art. *Pelvis.* See also the first number of the *Traité d'Accouchements* of M. P. Dubois, and the *Atlas Complémentaire de tous les Traités d'Accouchements,* of Lenoir).

CHAPTER III.

OF THE INTERNAL ORGANS OF GENERATION.

THE internal organs of generation are the vagina and the uterus, together with its appendages, the Fallopian tubes and ovaries.

ARTICLE I.

OF THE VAGINA.

The vagina, or vulvo-uterine canal, is a cylindrical membranous tube, extending from the vulva to the uterus; it is situated in the pelvic excavation between the bladder and rectum; extending from the vulva to the superior strait, it has of course the same direction as the general axis of the pelvis: that is, it forms a curve, the concavity of which is anterior; the walls are soft and yielding, flattened from before backwards, with their surfaces in contact. Its length varies from four and a quarter to five and a quarter inches, though, according to Professor Velpeau (*Leçons Orales*), it is much less than has been generally imagined, or than he himself has pointed out in his works, being hardly two and a quarter to two and three-quarter inches long. Although this remark may be true, if the length be measured in the dead subject, where the soft flabby walls of the vagina easily yield under their own weight and that of the uterus, and in consequence, the vertical extent of this cavity does not exceed three or three and a half inches; yet, the elasticity of these walls will permit the introduction of a speculum five or six inches long, and when the uterus is raised completely above the superior strait, the estimate of the Professor of La Charité is certainly below the truth.

The length of the vagina varies in different females; thus, for instance, the negress has it longer and more spacious than the European, as a general rule. Professor Chomel informed me that he had frequently remarked this fact, and I have since had occasion to verify its truth; nor is the vagina uniform in its size, in all parts of its extent; for the inferior orifice is the most contracted, the superior extremity is the largest, whilst the middle part, especially in women who have had many children, frequently exhibits a considerable extension. The walls apparently retract in aged females, and greatly diminish the area of its cavity, returning very nearly to the same dimensions as are found in young girls.

This canal is sometimes very short, reduced even to one and a half or two inches; but this congenital brevity must not be confounded with the apparent shortening produced by the descent of the uterus.

M. Cruveilhier says these cases are daily confounded in practice, though nothing, however, is easier than to distinguish them from each other; for, in the former one, the uterus cannot be raised, whereas, in the case of descent, it yields without resistance to the pressure of the finger, and resumes its natural position.

Congenital shortening is a frequent cause of sterility, as well as of sharp pains in coition, and is a fruitful source of the acute or chronic inflammatory engorgements of the uterus. I have met with a case of considerable shortening of the vagina, in which the os tincæ had been sufficiently dilated by the *membrum virile*, to admit the index finger. In some instances the repeated coition produces a sort of artificial vagina, behind the os uteri, at the expense of the posterior vaginal wall, and if the finger be then carried under the neck of the womb, it will dip into a pocket, the anterior wall of which is placed against the posterior one of the uterus. This artificial vagina, produced by forcing up the posterior cul-de-sac, is sometimes longer than the natural canal.

The vagina is in relation by its external face: in front, with the bas-fond of the bladder, to which it is united by some condensed areolar tissue, and also with the canal of the urethra, which indeed appears to be channelled out in its substance; behind, it is connected with the rectum, superiorly by a double fold of peritoneum, and inferiorly by areolar tissue, which is less condensed than that existing in front. Hence, the rectum is seldom drawn upon in the displacements of the uterus, whilst the bladder always participates more or less in these accidents. The lateral borders afford attachment, above to the broad ligaments, and below to the pelvic areolar tissue and to some venous plexuses.

The internal face of the vagina is covered by a mucous membrane, continuous with that of the uterine cavity, excepting that its epithelium is not prolonged into the orifice of the latter, but terminates by a sort of denticulated border, similar to the relation of the œsophageal epidermis with the stomach; the internal surface also exhibits some wrinkles or rather some transverse elevations near the vulvar orifice. A raphé, or prominent ridge found on the median line, extends the whole length of the anterior wall of the vagina, affording origin to all those rugæ; but the raphé is not so well marked on the posterior parietes as on the anterior; the term *columns of the vagina* has been applied to these two ridges.

The transverse rugæ are much better developed in young virgins and aged females; but, on the contrary, during pregnancy, and for a short time after delivery, they are nearly effaced. These transverse rugæ have by some physiologists been regarded as organs of special sensation, and as designed to increase friction by the irregularities which they present.

[The upper extremity of the vagina embraces the neck of the uterus, to which it is attached, at the junction of the lower with the middle third. The neck is thus divided into two portions, an intra-vaginal and a supra-vaginal portion. At the point of insertion there is a true continuity of tissue between the vagina and uterus, inasmuch as on the one hand the vaginal mucous membrane is simply reflected so as to form the mucous membrane of the os tincæ, whilst on the other, the muscular fibres of the vagina are directly continuous with those of the uterus.]

In thus folding upon itself in order to embrace the neck, the mucous membrane of the vagina forms a circular groove or cul-de-sac, described as the *anterior* and *posterior cul-de-sac*. The posterior one is, generally, deeper than the anterior, owing probably to the insertion of the vagina behind, upon a more elevated point of the neck.

The inferior extremity, or vulvar orifice, presents, in front, a transverse rugous prominence, that seems to diminish the entrance.

Structure of the Vagina. — [The walls of the vagina average in thickness from one-eighth to three-sixteenths of an inch. It is composed of three layers: one, external or cellulo-fibrous; a middle or muscular one; and the internal or mucous.

The external layer is composed of fibres of both elastic and connective tissue; it blends externally with the organs surrounding the vagina, and internally with the middle layer.

The middle layer is composed of muscular fibres which are inserted in front upon the branches of the ischium and pubis, and are continued upward to become blended with the middle layer of fibres of the uterus. Some again disappear upon the utero-sacral ligaments, whilst others cross each other in all directions, leaving interspaces occupied by projecting veins.

The internal or mucous layer is of a pale-red color, which becomes violet during menstruation and especially during pregnancy. Its external surface is confounded with the preceding layer, whilst its internal is covered with tessellated epithelium and abounds in folds analogous to papillæ. For a long time this membrane was supposed to be rich in mucous follicles, but anatomists now agree in the opinion that the vagina is destitute of mucous glands.

In great part, the walls of the vagina are composed of a tissue possessing all the characters of spongy erectile tissue; that such is the case has been proved beyond cavil by the researches of M. Kobelt and Ch. Rouget.]

According to Kobelt, this erectile tissue is composed of several superposed layers of venous network which proceed from the bulb, the finest ramifications extending into the mucous membrane. This true spongy body extends continuously through the entire limits of the vestibule and of the vagina, and seems connected with the veins of the parenchyma of the uterus. The great vascularity of the walls of the vagina explains, to a certain extent, the dangers consequent upon their rupture. Surrounding the lower extremity of the vagina are a few muscular fibres, that constitute what is erroneously called (see below) the constrictor vaginæ muscle. In some females, this is quite strong and well developed.

Finally, under the name of *bulb of the vagina*, a swelling or cavernous body is described, that separates the orifice of this canal from the roots of the clitoris: moderately thick in the centre, where it is placed between the meatus urinarius and the junction of the cruræ clitoridis, it gradually swells out, as it recedes from this point, and terminates below in an enlarged extremity on the sides of the vagina, being deficient, however, on the posterior wall of this canal. The length of the bulb, when injected, is about one inch and three-eighths of an inch; its greatest width, from one-half to three-quarters of an inch, and its thickness from about three-eighths of an inch to one-quarter of an inch. (Kobelt.) The bulb of the vagina is composed of an erectile tissue analogous to that of the bulb of the urethra in the male, and communicates freely, as shown by M. Deville, with the cavernous tissue of the clitoris, by means of several veins of considerable size.

The bulb of the vagina is surrounded, as it were, by a layer of muscular fibres (*constrictor cunni*), in regard to the arrangement of which authors differ. According to Kobelt, there are two constrictor muscles. It takes its origin by a large and flattened base from the aponeurosis of the perineum, almost directly at the middle of the space which separates the anus from the tuberosity of the ischium; thence it rises, becoming at the same time narrower towards the clitoris, and covers or rather embraces in the shape of a half cylinder the entire length and width of the bulb of the vagina.

A closer examination, says Kobelt, shows that this muscle is composed of two flattened layers, the deeper of which glides in between the upper border of the bulb and the root of the clitoris, and so appears above the urethra to unite with the muscle of the opposite side; the upper layer, on the contrary, which is also flat, rises upon the back of the clitoris, and is connected with its fellow by a flat and narrow tendon.

This muscle, which is, in fact, at a considerable distance from the vaginal orifice, has been erroneously regarded as a sphincter of the vagina. Now its power to diminish the orifice of the vagina is but momentary, and only by compressing the bulb when greatly distended at the moment of coition. Its proper office is, in fact, that of a compressor of the bulb, whilst its upper extremity tends, at the same time, to depress the gland of the clitoris towards the vestibule.

Vessels.—The vaginal arteries come from the hypogastric; the veins are very numerous and plexiform, and discharge into the hypogastrics; the lymphatics empty into the ganglions of the pelvis, and the nerves arise from the hypogastric plexus.

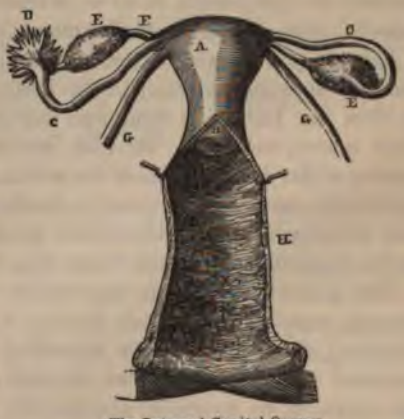
The vagina serves in the female both as the organ of copulation and as the canal for the passage of the menstrual fluid, and for that of the product of conception.

ARTICLE II.

OF THE UTERUS.

The uterus is the organ of gestation, in which the ovum is destined to remain, from the period of its escape from the Fallopian tube, until the moment of final delivery.

Fig. 23.



The Internal Genital Organs.

A. The uterus, seen on its anterior face. B. The intra-vaginal portion of the neck of the uterus. C C. The Fallopian tubes. D. The pavilion, or fimbriated extremity of the tube. E E. The ovaries. F. The ligament of the ovary. G G. The round ligaments. H. The vagina, laid open.

On the right, the fimbriated extremity of the tube is seen applied to the ovary.

In form, it resembles a small gourd, or a pear flattened from before backwards, having its base turned upwards and the apex downwards.

The organ is divided into two parts, the superior of which, called the body, is the largest, and comprises more than half the total length; the other, or inferior portion, styled the neck, is smaller; a slight circular constriction serves to indicate externally the point of union of the body with the neck.

The axis runs from above downwards, and from before backwards, corresponding nearly with that of the superior strait.

It is situated in the excavation,

usually on the median line, between the bladder and rectum, being retained in position by the round and the broad ligaments on the sides, and below by the vagina, upon which it rests.

[The situation of the uterus is affected by the fulness or emptiness of the bladder. When the latter is empty, the uterus is near the pubis and the neck directed backward. When the bladder is full, the uterus is pushed back, and its axis corresponds nearly with that of the vagina.]

As we have said before, the neck of the uterus is embraced about its middle by the mucous membrane of the vagina, being thereby divided into two portions, of which the one situated above the insertion of the vagina is called the superior vaginal; and the other, which projects into the upper part of that canal, is termed the inferior vaginal portion of the neck.

The connections of the uterus are very loose and extensible; it therefore exhibits a great degree of mobility, and may easily be moved in every direction.

Its volume varies with age, being quite small prior to the fifteenth year, but augmenting rapidly at this era; the womb never resumes completely its primitive dimensions in women who have borne children, and finally, in advanced age, it often appears to waste away, and to dwindle down to the size it had prior to the fifteenth year. Its dimensions after puberty are as follows, viz.: The vertical diameter varies from two and five-eighths to two and three-quarter inches; the transverse one, at the fundus, one and three-eighths to one and a half inches. Certain physiological conditions produce a great augmentation in its volume. For instance, I have frequently observed at the approach of the monthly courses, that it presented twice the ordinary size at least, and in some women the increase in volume is so marked at this period as to be mistaken for the commencement of a pregnancy. (See *Diagnosis of Pregnancy.*)

The uterus likewise varies in situation at different epochs; thus it surmounts the superior strait in the fœtus, and rests in the abdominal cavity, so that the Fallopian tubes and ovaries occupy the iliac fossæ, the fundus uteri corresponding to the fifth lumbar vertebra. After birth, in consequence of the development of the pelvis, it appears to sink gradually into the excavation, and, at ten years, the fundus is on a level with the superior strait, but subsequently gets below this point. The womb is generally inclined to the right or left in aged females, or is turned backwards on the rectum.

The axis of the uterus approaches that of the inferior strait in many women, especially in those having a short vagina. It must further be observed, that the direction described by us as normal, is far from being constant in all women; thus, in some cases, the fundus may be thrown so far forwards as to render the anterior wall the most inferior part, thereby constituting what pathologists have described as an *anteversion;* in others, the superior border is thrown towards the most inferior portion of the sacrum, the neck being carried behind the posterior face of the pubis, thus producing a *retroversion;* again, it is often turned towards one side of the excavation, the neck being directed to the opposite side: this is *lateral version.*

Another singular anomaly in the relative direction of the axis of the body and that of the neck of the uterus remains to be described. In the normal condition, the axis of the neck seems to be identical with that of the body, and to be simply a continuation of it. Now, in some subjects, the body of the uterus is found to form with the neck an angle which approaches more or less to a right angle, as though one of these parts had been strongly bent upon the other, like the body of a retort upon its beak. This inflexion may take place anteriorly, posteriorly, or laterally, and has been styled accordingly, *anteflexion*, *retroflexion*, and *lateroflexion*.

This alteration in the relation of the axis of the body with that of the neck of the womb may occur accidentally, and we have several times observed it as a consequence of anteversion or retroversion, but certainly it is often congenital, and then, should it remain after puberty, and especially should it increase in extent, it might become a cause of sterility.

[It is by no means uncommon to find a uterus presenting a curvature with concavity directed in front, the curve being most marked at the junction of the body with the neck. This flexion, which in the adult is exceptional, is the normal condition in the fœtus at term. The researches of Boulard, Verneuil, and Follin, have proved this to be a fact which may be verified at any time. The question then arises, Is this inflection inherent to the uterus itself, or is it due to the form of the neighboring organs? The discussions upon this point have been resumed by M. Sappey, who thinks that the curvature varies according as the bladder is full or empty, the uterus merely moulding itself upon it as it were. When the bladder is empty, the abdominal viscera press upon the fundus of the womb and bend it forward. Should death supervene under these circumstances — the uterus is overtaken, so to speak, by the cadaveric rigidity whilst in its deviated condition, and at the autopsy presents an inflexion apparently permanent and inherent in the organ itself, but which disappears if the bladder be filled by injection, having first taken care to place the body for some time in warm water so as to restore suppleness to the tissues.]

The weight of the womb, in girls at puberty, is from six to ten drachms; but in women who have had children, it ranges from an ounce and a half to two ounces; and from one to two drachms in very aged females.

The uterus exhibits an external and an internal surface.

§ 1. EXTERNAL SURFACE.

In the study of the external surface we should recognize the division into the body and the neck.

OF THE BODY OF THE UTERUS. — The external surface presents for our study two faces, two borders, a base, and an apex.

The anterior face of the body is slightly convex, is covered by the peritoneum on its superior three-fourths, and lies in a mediate relation with the posterior face of the bladder, from which it is frequently separated by some folds of the small intestine; whilst, at the inferior fourth, it is in contact with the bas-fond of the bladder, to which it is united by some loose cellular tissue. This latter connection explains the frequent participation of the bladder in the uterine displacements, however inconsiderable they may be, as also how in certain cases vesico-uterine fistulas may be produced after difficult labors.

The posterior face is much more convex than the preceding, being covered throughout its whole extent by the peritoneum; it is in a mediate relation with the anterior surface of the rectum, the intestinal convolutions, however, often separating them; it may be readily examined through the rectum. The lateral borders are slightly concave, affording an attachment to the broad and the round ligaments; but, as M. Cruveilhier remarks, these ligaments are attached to the anterior edge of the borders, and hence all the thickness of these margins is found behind the broad ligaments, and consequently the latter are on the same plane as the anterior face of the womb.

The base, fundus, or superior border of the womb is convex, looking upwards and forwards, and covered by the convolutions of the small intestine. It never attains the level of the superior strait in the unimpregnated state, and therefore it is only possible to feel it through the inferior abdominal wall, by using great pressure.

At the junction of this base with the lateral borders of the body the two angles are formed, from which the Fallopian tubes and ligaments of the ovary arise.

The apex or inferior angle is continuous with the neck, which next claims our attention.

OF THE NECK OF THE UTERUS.—Very remarkable differences are found between the neck of the uterus in a woman who has borne children, and that in one who has never been a mother; we shall, therefore, consider it successively in each, because the modifications it undergoes during pregnancy can only be appreciated after a careful study of the ordinary condition.

1st. *In the woman who has never been a mother*, the neck of the uterus is from an inch to an inch and three-eighths in length, and is separated from the body by a narrow, constricted portion, which can easily be distinguished, even on the exterior of the organ. At the central part, where it is a little enlarged and fusiform, it is about three-quarters of an inch in the transverse diameter, and half an inch in the antero-posterior one. Near the junction of the superior third with the inferior two-thirds, it is embraced by the upper end of the vagina, which descends a little lower on the anterior than on the posterior face, whence the subvaginal portion of the neck is somewhat longer behind; but the contrary is true for that part above the vagina.

The cervix is terminated by an extremity that is less voluminous than the other portions of its extent, so as to present a conical form to the finger. This extremity bears the name of the *os tincæ*, or tench's mouth. The os tincæ presents two lips, separated by a small transverse fissure, somewhat swollen in the middle, called the external orifice of the neck. The orifice is sometimes difficult to find in a young marriageable girl. But, according to Dubois, if the index encounters it, we may recognize the part by comparing the sensation then experienced with that produced by applying the pulp of the finger upon the extremity of the nose, and feeling the depression between the alæ nasi. The anterior lip is the thicker, though both are very nearly of the same length, the anterior one, perhaps, descending a little lower than the other. Most authors teach that the anterior lip of the neck descends lower than the posterior. In detaching the uterus from a dead body, no great difference, however, is observed in this respect, but, on the contrary, if we touch a female, the distinction is much better marked. I believe this results solely from the fact of the neck being directed a little posteriorly, so that the surface of the os tincæ is not horizontal, but inclined backwards; and, therefore, the anterior lip is necessarily somewhat lower than the posterior. Besides, the finger in passing from below upwards, and from before backwards, must first encounter the anterior lip, and is then obliged to go higher and further behind to reach the posterior one. These lips are smooth and polished throughout, neither presenting any inequalities nor any depressions; in fact, the whole external surface of the neck is equally smooth, and without elevations.

The cervix, as already stated, is slightly directed backwards, so that, if prolonged, it would terminate near the coccyx, or the most inferior part of the sacrum. It is situated in the upper half of the excavation, yet the finger can easily reach and pass over its whole exterior surface.

2d. *In the female who has had several children*, the neck has not the same aspect, and the length is so variable that it is not possible to announce it in advance; though we may say, in general terms, that it is shorter in proportion to the larger number of children the woman has borne, a portion of it seeming, as it were, to have been destroyed at every labor.

Two females, one of whom had seventeen, the other nineteen children, have been under my care; the neck in each of them was completely destroyed, in its intra-vaginal portion. No prominence was found at the superior part of this canal, and the finger only encountered two little tubercles, as large as a lentil, separated by an open orifice, by which latter alone the neck could be recognized.

This diminished length of the intra-vaginal portion of the neck in women who have borne many children, is due to the strong traction upon the upper extremity of the vagina in the preceding pregnancies, produced by the elevation of the uterus; in consequence of this traction, and the laxity of its adhesions with the middle part of the neck, the vagina becomes detached from it at that point, and adheres to it only at its inferior extremity. When this has occurred, it is plain that the portion which projects into the vagina must be much less considerable than before. Although it still preserves a certain length, the regular form that it previously had is wanting, for it is no longer a fusiform body, with an exterior surface polished and smooth everywhere, but a kind of irregular teat, covered on its external face by more or less numerous elevations.

Sometimes it is more swollen at the inferior portion, whilst the upper part appears to be hollowed out in its whole circumference by a deep excavation.

The orifice of the os tincæ is sufficiently patulous to admit the extremity of the finger, or even one-half of its ungual portion may occasionally be introduced. The lips are unequal, presenting a variable number of notches. Being rarely found on the middle part of the lips, these depressions are continually met with about the level of the commissures, and more frequently on the left side than the right. They result from the lacerations that have occurred in former labors, at the moment when the head cleared the os uteri; and the lochial discharges have prevented the lips of these little wounds from uniting, and they have cicatrized separately. The depressions are sometimes so numerous as to subdivide the lips into six or eight small tubercles, separated by as many fissures of variable depth.

In case the woman has not had children for several years, and more especially if she has had but one or two of them, these characters are much less determined, the orifice is nearly obliterated, and the neck has gradually resumed its primitive form; nevertheless, the fissure of the orifice is always sufficiently marked, as well as the inequalities on the lips, to indicate antecedent labors. These marks may become more and more faint, but they never disappear altogether.

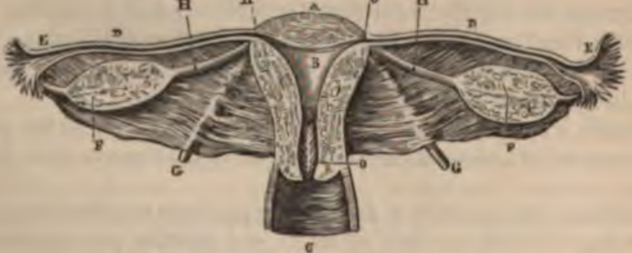
The frequency of these depressions on the left side may be, I think, readily explained. When the head passes through the neck, it is evident that, if a laceration be produced, it will be at the point which sustains the greatest strain. Now, the left occipito-iliac positions being much the more frequent, the occiput, which constitutes the largest extremity of the head, will consequently correspond to the left commissure of the neck. Further, the uterus is habitually inclined to the right, so that the line of its contractions is directed from right to left, and, therefore, acts more energetically on the left side of the cervix. Hence the greatest strains occur at this point.

§ 2. INTERNAL SURFACE.

[The uterus has an internal surface which defines its cavity. This cavity has, in the virgin condition, a longitudinal extent of about two and a quarter inches, and of two and a half inches after several labors. We may distinguish the cavity of the body and the cavity of the neck. The length of the former is, in virgins, rather less than that of the neck, whilst in multiparæ the two dimensions are nearly equal;—that of the body being, perhaps, rather greater than that of the neck.

A. *The cavity of the body* is triangular in shape, having two faces, three edges, and three angles. The two faces are plane, and separated only by a thin layer of mucus, so that they may be said to be in contact.

FIG. 24.



Cavity of the Uterus and the Fallopian Tubes.

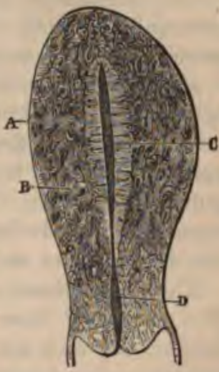
A. Superior border or fundus of the womb. B. Cavity of the womb. O. Cavity of the neck of the uterus. D. The canal of the Fallopian tube cut open. E. The fimbriated extremity or pavilion, likewise laid open. F F. The ovaries, one-half of which has been removed so as to bring into view several of the Graafian vesicles. C. The cavity of the vagina. H H. The ligaments of the ovaries. G G. The round ligament.

Of the three edges, the upper extends from the orifice of one Fallopian tube to the other, and the two lateral ones, from the orifice of each tube to the upper or internal orifice of the neck. In virgins, the three edges are curvilinear, with convexity directed inward; in multiparæ, they are either rectilinear, or present a slight curvature with concavity directed internally.

The three angles are described as the superior or lateral, and the inferior. The two superior angles are at the extremities of the upper edge where it joins the lateral edges, and where are situated the very minute orifices of the Fallopian tubes. The inferior angle, formed by the convergence of the two lateral edges, also presents an opening in the internal orifice of the neck, by which the cavity of the body communicates with that of the neck.]

In the state of vacuity, no cavity, to speak correctly, exists in the womb, for the uterine walls are in contact throughout their extent; the cavity, like that of the pleura for example, has a real existence only when the walls become separated by a liquid effusion. Fig. 25 will afford an idea of the dimensions of the uterine cavity when empty.

FIG. 25.



This profile view gives an exact idea of the dimensions of the cavity of the body and of the neck of the womb in a state of vacuity.

A. Mucous membrane. B. Tissue proper. C. Cavity of the body. D. Cavity of the neck.

The congenital deficiency of a cavity in the body is very rare, but yet no trace of it existed in a uterus presented to M. Cruveilhier by M. Rostan, although that of the neck remained. In aged women, however, it is not very rare to find the cavity partly effaced by more or less extensive adhesions.

B. The *cavity of the neck* is fusiform, (see Figs. 24 and 25,) flattened from before backwards, and presents an assemblage of rugæ on its anterior and posterior walls, which constitute a median vertical column upon each wall, occupying the whole length of the neck, and from which a number of smaller columns pass off at various angles, representing a fern in relief. The term *arbor vitæ* has been applied to these rugosities. After delivery they frequently disappear, but sometimes they still persist.

[M. Guyon observes very correctly, that the vertical column situated upon each of the walls is not exactly upon the median line; that on the posterior wall being a little to the left, and that on the anterior wall a little to the right. From this arrangement results a complete fitting or adjustment of the two walls to each other, which is especially observable at the internal orifice. Both columns disappear at the superior orifice of the cavity of the neck.

The superior or internal orifice of the neck is not a narrow ring, but is about three-eighths of an inch in extent, and might with great propriety be termed the *intermediate portion.* It forms, in fact, a sort of strait between the cavities of the body and neck. M. Guyon, who has given a good description of this arrangement, also states that after the menopause, the internal orifice often grows narrower, and is sometimes entirely obliterated.]

The uterine cavity likewise exhibits a variable number of transparent vesicles, mistaken by Naboth for eggs, hence they have been called the *ovula Nabothi.* These vesicles are nothing more than simple muciparous follicles, and they are particularly abundant in the neighborhood of the neck. They secrete a gelatinous mucus, which may accumulate in the cavity of the neck, and so obstruct it as to render fecundation impossible.

The internal surface of the uterus is much more vascular in the body than in the neck. This difference is particularly well marked in women who have died during the menstrual period. The cavity of the body is of a rose color, and that of the neck of a pearly gray hue, which is probably due to the slight vascularity of this part in comparison with that of the lining membrane of the body.

§ 3. STRUCTURE OF THE UTERUS.

In the ordinary condition of the womb, this structure is difficult to make out, but it becomes much more evident during the period of gestation.

The constituent parts of the organ are: a middle or tissue proper, an external peritoneal membrane, and an internal mucous one, together with numerous vessels and nerves.

A. *Tissue Proper.*—This tissue is of a grayish color, and is very dense in structure, creaking like cartilage under the scalpel. In general, the neck appears less firm in consistence than the body, resulting, as M. Cruveilhier supposes, from the former being the more frequent seat of sanguineous fluxions. It sometimes happens, as after a suppression of the menses, or just before or after menstruation, that the uterus has a more decided red color and its tissue is more supple. (See *Menstruation.*)

The proper tissue of the womb is composed of fibres disposed lengthwise. The nature of these fibres has led to numerous discussions, but at the present day they are proven by the microscope to be muscular, and since this muscular nature becomes clearly evident towards the end of gestation (see *Pregnancy*), we must acknowledge that, notwithstanding the fibrous appearance of its tissue in the unimpregnated condition, the fibres composing it are not the less muscular in their structure. This organization is concealed by the state of condensation; of atrophy, maintained either by inertia or want of action; but which becomes distinct, in consequence of the very considerable determination to the uterus, of its distention, and of the development of its fibres during pregnancy.

According to most anatomists, the direction of these fibres in the state of vacuity is very irregular, and their inter-crossing is nearly inextricable, as every one must confess, in this particular condition, says M. Cruveilhier. But as the structure of the uterus, except in gestation, is not of any consequence (practically speaking) to the accoucheur, we refer to the article *Pregnancy* for the more particular study thereof.

B. *The External or Peritoneal Membrane.*—The peritoneum having covered the posterior face of the bladder, is reflected upon the anterior one of the uterus, covering only its superior three-fourths; and having reached the fundus uteri, and gained the posterior wall, it covers this entirely, is prolonged on the vagina for a short distance, and is then reflected upon the rectum. The broad ligaments are produced by the transverse elongations of this membrane; and its falciform folds, seen in the interval that separates the bladder from the uterus, are called the *vesico-uterine*, or the *anterior ligaments;* and those formed by it, between the rectum and uterus, are called the *posterior*, or the *recto-uterine ligaments.* The adherence of the peritoneum is quite loose on the borders of the uterus, but it becomes more intimate towards the median line.

C. *The Internal or Mucous Membrane.*—The existence of this membrane was for a long time contested, and there can be no doubt, that if a membrane resembling the majority of those which line all the mucous cavities be sought for in the uterus, it will be sought in vain. Still its existence is rendered very probable by the functions of the organ, for, as Cruveilhier has remarked: 1st. Every organic cavity communicating with the exterior is lined by a mucous membrane. 2d. Anatomy demonstrates that the vaginal mucous membrane is continued into the cavity of the neck, and then into that of the uterus. 3d. When examined by a lens, the internal surface of the uterus exhibits a papillary disposition, but the papillæ are imperfectly developed. 4th. This internal surface has follicles or crypts scattered over it, from which mucus can be squeezed out, and which, if their orifices be obstructed or obliterated, become distended by the liquid, and form little vesicles. 5th. It is continually lubricated by mucus. 6th, and lastly; the internal surface of the uterus, like all other mucous membranes, is subject to spontaneous hemorrhages, to catarrhal secretions, and to the mucous, fibrous, and vesicular vegetations called *polypi;* and it is generally admitted that, wherever there is an identity of action, there is also an identity of nature.

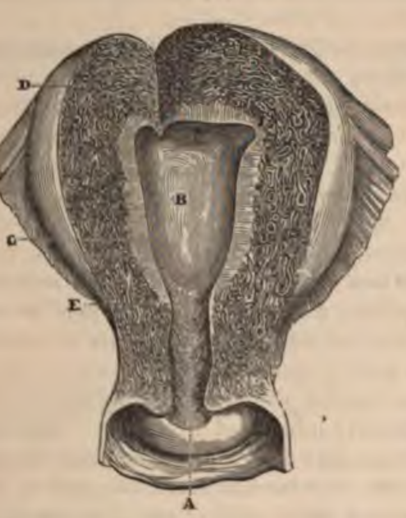
These physiological probabilities are at present fully confirmed by anatomical research, the numerous preparations in the possession of M. Coste leaving no doubt whatever as to the existence of the mucous membrane. I shall therefore borrow from this able physiologist the principal facts which pertain to its description.

The thickness of the uterine mucous membrane varies in different parts of its extent. Towards the middle of the body, it forms one-fourth of the thickness of the walls of the uterus; that is to say, its usual depth at this point is from one-eighth to three-sixteenths of an inch, amounting to about the one-fourth of the thickness of the uterine parietes. It thins off rapidly towards the point of union of the body with the neck, as also towards the apertures of the Fallopian tubes. Its greatest thickness in the neck does not exceed the one twenty-fourth part of an inch.

The thickness of the mucous membrane is clearly exhibited by the assistance of a perpendicular section of the uterus. It is then found to be injected, and varying in color from a deep or bright red to a semi-transparent reddish or pearly gray: the muscular tissue, on the contrary, is almost always of a reddish-gray color, and is besides easily distinguished by the numerous vascular openings upon the surface of the section, and from which blood may be caused to exude by pressure. In addition, there is always a whitish line of demarcation between the two tissues, which becomes most distinct when the injection of the mucous membrane is greatest.

Its consistence is less than that of the tissue proper of the uterus, being very friable, and easily crushed.

FIG. 26



This figure represents the arrangement of the mucous membrane and of the tissue proper of the uterus, as also their relative dimensions.

A. Cavity of the neck and arbor vitæ. B. Cavity of the body. C. Mucous membrane. D. Intervening membrane. E. Represents the marked thinning off of the mucous membrane towards the neck.

It adheres very strongly to the substance of the uterus, and is separated from it with great difficulty: it is also incapable of any gliding motion upon the parts which it covers, on account of the entire absence of a sub-mucous cellular tissue.

Its internal surface presents a multitude of small orifices, rather regularly arranged, which, though barely perceptible to the naked eye, become very evident with the assistance of a lens. About forty-five of them are contained in a space equivalent to the square of one-eighth of an inch. They are the orifices of glands.

M. Robin has given an excellent description of the elements which enter into the composition of the mucous membrane; they are:

1. Embryo-plastic nuclei; 2. Elements of laminated tissue; 3. Special cells, in very small amount except during pregnancy; 4. Amorphous connective matter; 5. Glands; 6. Capillary vessels; 7. Epithelium, at first prismatic but becoming pavimentous during pregnancy. A few words in regard to the uterine glands.

Two species of glands exist in this mucous membrane, one being found only within the body of the uterus, whilst the other is confined to the neck.

1. According to M. Coste, who was the first to describe them, the glands of the body are especially visible when death has occurred during menstruation; they then appear as minute canals of about the one two-hundred-and-fiftieth part of an inch in diameter, placed vertically beside each other. They are, however, disposed so compactly, that the mucous membrane as seen by a lens appears to be formed of them almost exclusively. Their adherent extremities terminate in culs-de-sac and repose upon the muscular tissue. The bodies of the glands are rendered somewhat flexuous by the mucous membrane being too thin, as it were, in the state of vacuity, for the length of the tubes. They contain a whitish, viscid fluid, which may be squeezed from them, especially at the menstrual period.

2. The glands of the neck (glands, or ovula of Naboth) are found in all the interval between the line separating the cavity of the neck from that of the body, and the neighborhood of the borders of the os tincæ. Their orifices are readily seen upon, and especially between, the folds of the arbor vitæ.

These glands have the form of a minute cylinder, terminating in a rounded cul-de-sac, which is inflated into the form of a lentil or vial, and inclosed in the tissue of the mucous membrane, even descending a little between the fibres of the muscular structure.

The excretory orifice is always smaller than the glandular tube. Pressure causes the escape from it of a transparent, viscid, tenacious, and completely homogeneous fluid.

We shall treat hereafter of the modifications which these glands undergo during gestation.

[The epithelium of the uterine mucous membrane is cylindric, with vibratile cilia moving from without inward. It is therefore impossible that the ciliary motion should carry the spermatic fluid toward the openings of the tubes, as has been erroneously supposed.

The entire cavity of the body and of the neck, to a point near the external orifice of the latter, is covered with vibratile epithelium. Below this point the mucous membrane of the neck is furnished with the pavimentous variety.

D. *Vessels.*—The arteries of the uterus proceed from the hypogastric and ovarian arteries. Both present many flexuosities in their course through the tissue of the organ, and are remarkable for their corkscrew form, recalling the arrangement of the helicine arteries. The neck is less vascular than the body.

The veins are highly developed, anastomosing freely, and forming cavities, as it were, in the muscular tissue. They are called *uterine sinuses*, and communicate largely with the venous plexuses within the folds of the broad ligaments. From the latter proceed the uterine and ovarian veins which empty into the corresponding trunks.

From the arrangement of the uterine arteries and veins, surrounded as they are everywhere by muscular partitions, it results, that the uterus is a true erectile organ, as has been placed beyond doubt by an excellent memoir published by Professor Rouget. This skilful anatomist has, in fact, shown that by injecting the veins of the uterus the organ is put in a state of true erection, whereby it rises, swells, and moves up toward the abdomen. Under these circumstances its volume is greater by one-half than in the empty condition, and the walls of the cavity separate from each other. These phenomena doubtless take place during coition, and probably facilitate the ascent of the spermatic fluid.

The *lymphatic vessels* are very abundant, and pass into the pelvic and lumbar ganglia.

E. *Nerves.*—The nerves are derived from the great sympathetic, some of them proceeding from the renal and others from the hypogastric plexuses; to the latter are united some fibres from the sacral plexus.]

It is an important practical remark of M. Jobert, that the entire intravaginal portion of the neck is destitute of a supply of nervous fibres, whilst the portion above the insertion of the vagina receives a great number of them, which form species of plexuses, furnishing ascending or uterine branches and descending or vaginal ones. The latter are extremely numerous, and ramify to infinity in the substance of the vagina.

This distribution, which would explain a number of physiological and pathological facts, needs confirmation from new researches, for recent preparations deposited by M. Boulard in the museum of the School of Medicine, give it a formal denial.

Development.—According to some authors, the uterus is bifid in the embryo as late as the end of the third month, but M. Cruveilhier says he has never observed this bifurcation. During the intra-uterine life, the volume of the neck surpasses that of the body, and at this period its largest portion corresponds to the vaginal extremity. After birth it remains nearly stationary until puberty, and then it acquires in a very short time the dimensions observed in the adult woman. The organ often becomes atrophied in old age.

§ 4. Ligaments of the Uterus.

We have already spoken of the anterior and posterior ligaments. The broad and round ones still remain to be described.

The Broad Ligaments.—As elsewhere stated, the double lamina of the peritoneum, which covers the anterior and posterior faces of the uterus, is prolonged transversely, the two folds resting against each other, and forming by their union a transverse partition, extending from each side of the uterus, which divides the pelvis into two cavities; the anterior of which lodges the bladder, and the posterior the rectum. Outwardly, and below, these ligaments are continuous with the peritoneum that lines the excavation; their superior border is free, and is extended from the angles of the uterus to the iliac fossæ presenting three folds, called the wings. The anterior wing is not admitted by some anatomists; it is but slightly developed, and is occupied by the round ligament. The middle one incloses the Fallopian tube, and the posterior contains the ovary and its ligament.

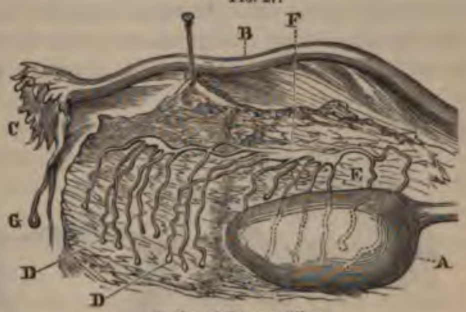
[Between the two layers of serous membrane, whose apposition forms the broad ligament, are found two muscular layers, discovered and described by M. Rouget, who represents them as formed of muscular fibres making by their interlacement a network in a transverse direction. The anterior of these two layers is continuous with the superficial muscular fibres of the anterior surface of the uterus, and is directed outward so as to form a part of the round ligament. The posterior muscular layer is continuous with the superficial fibres of the posterior surface of the uterus, and is so directed outwardly as to become attached for the most part to the sacro-iliac symphysis.]

The two serous folds that constitute the broad ligament, are separated by a loose and very extensible lamellated cellular tissue, continuous with the *fascia propria* of the pelvis. The broad ligaments disappear during gestation, their two laminæ assisting to cover the anterior and posterior faces of the developed womb.

Body of Rosenmuller. By the inspection of pieces prepared by M. Follin, we have become assured of the existence of an organ between the two laminæ of the broad ligament, which has not been even noticed by

French anatomists, but which certain German anatomists figure under the name of the *organ of Rosenmüller*, who was the first to discover it. Its general arrangement is not yet well understood, its development is involved in obscurity, and the details of its histology had not hitherto been described. The researches undertaken by M. Follin in reference to this subject show, that the organ is composed of seven or eight tubes folded upon themselves, terminating in blind extremities, and all converging towards the tube which serves as a point of entrance for the vessels of the ovary. The tubes are generally closely approximated to each other, so that their inflexions frequently correspond. When examined by transmitted light, the assemblage of canals is distinctly seen in the broad ligament near the fimbriated extremity of the Fallopian tube. Sometimes these tubes are not very apparent, and their number is much less, yet some are always to be found. They exist at all ages, but are much more readily distinguished in the broad ligaments of the fœtus, or of children, for then the slight development of the blood-vessels does not obscure them, nor are they hidden from observation by the fat, which infiltrates the laminæ of the broad ligaments in adults.

Fig. 27.



Bodies of Rosenmüller.

- A. Ovary.
- B. Fallopian tube.
- C. Fimbriated extremity of Fallopian tube.
- D. Culs-de-sac of the tubes.
- E. Canaliculi proceeding to the ovary.
- F. Point to which the tubes converge.
- G. Vesicle appended to the Fallopian tube.

The size of the tubes is variable: and they often present dilatations, and sometimes true cysts filled with a citrine fluid.

M. Follin has not been able to discover an *excretory orifice to these tubes, either in young girls or adult women.*

Their structure resembles that of the glandular tubes of many simple glands. They are provided with a central cavity, which presents the dilatations so often observed in tubes of this class. Externally, the tube is formed of cellular-tissue-membrane with longitudinal fibres. The internal surface of the tube is covered with pavement epithelium.

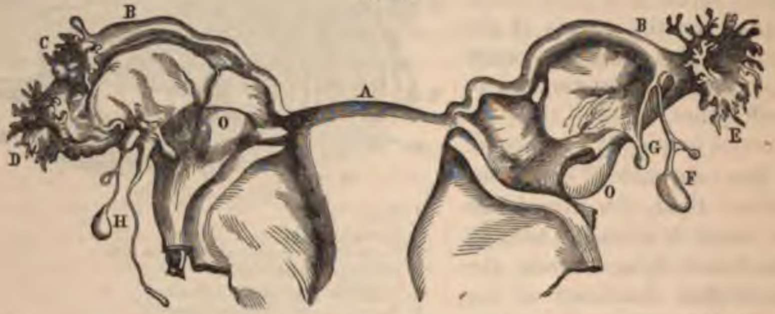
Some observations are calculated to produce the impression, without however confirming it, that this assemblage of tubes has, in its origin, some relation with the corpora Wolffiana.

Attached to the free edge of the broad ligaments, it is not uncommon to find five, six, or even more small cysts. They are generally connected with the ligament by a very slender pedicle, of variable length, but which is sometimes so short, that the cyst appears to be sessile, and directly adherent to the ligament. (See Fig. 28.)

It is difficult to understand the mode of the development of these cysts. They may, perhaps, have some relation with the tubes of which the bodies of Rosenmüller are composed. It has however seemed to us worth while to call attention to them particularly, as they are stated by M. Broca to be present in the great majority of cases.

The round ligaments, or supra-pubic cords, are evidently continuous with the tissue of the uterus, to which their proper substance is precisely similar; arising from the lateral border of this organ, below and a little in advance of the Fallopian tube, it runs upwards and outwards. According to M. Deville, this fringe, or ligament, is bent downward in the anterior fold of the broad ligament, and reaches the internal orifice of the inguinal canal, into which it enters, accompanied by a prolongation of the peritoneum, bearing the name of the Canal of Nuck. It then divides into a number of fibrous fasciculi, which are lost in the cellular tissue of the mons veneris and that which fills the dartoid sac, described as existing in the labia externa. According to Madame Boivin, the round ligament on the right side is the shorter and larger of the two. They contain a great number of veins, which are liable to become varicose.

FIG. 28.



The figure exhibits the small cysts appended to the free edge of the broad ligaments. One of the Fallopian tubes is represented with a double fimbriated extremity, as in the case described by G. Richard.

A. Uterus. B. Fallopian tubes. C. The additional fimbriated extremity. D, E. The normal fimbriated extremities. F, G, H. The cysts described above.

These ligaments serve to retain the uterus in position, and to prevent its displacements; and it is probably to them that the pains in the groins, experienced by some women during chronic affections or displacements of the womb, may be referred. They are, in a great measure, composed of cellular tissue and vessels, but containing also some muscular fasciculi, the superior of which are prolonged from the uterus, and the inferior come from the transversalis muscle. The superior muscular fibres are much more evident during pregnancy.

Finally, the *vesico-uterine* and *utero-sacral ligaments*, formed, as we have stated, of folds of the peritoneum, which, after having covered the uterus, are reflected upon the posterior surface of the bladder and the anterior surface of the rectum; these ligaments are, so to speak, reinforced by collections of fibres which appear to be prolongations from the tissue proper of the womb, and which are attached anteriorly to the posterior surface of the bladder, and posteriorly to the anterior surface of the rectum.

ARTICLE III.

OF THE FALLOPIAN TUBES.

The *uterine* or *Fallopian tubes* are two canals, varying from four and a quarter to five inches in length, and placed in the thickness of the superior border of the broad ligament. They extend transversely from the lateral angles of the womb nearly to the iliac fossa on the corresponding side. Their volume is made more evident by inflating them. (G. Richard.) It may then be ascertained that beyond the uterine parietes, the tube has a diameter of about three-sixteenths of an inch; towards the middle of its course it increases to about one-quarter of an inch, and just before the *ostium abdominale*, to five-sixteenths of an inch. Their calibre is very variable at different points. The elasticity of the walls is however so great as to allow of their increase to an enormous extent, as is proved by the cysts which are frequently found in them.

The internal orifice of the tube (*ostium uterinum*) is stated by M. Richard to be the one-sixteenth of an inch in diameter; from thence, the calibre of the canal increases gradually to its external orifice. Near the free extremity it spreads out and becomes fringed. This termination constitutes the pavilion, or fimbriated extremity (the morsus diaboli).

It is generally taught that one of these fringes, which is longer than the others, attaches itself to the extremity of the ovary. On the contrary, M. Cruveilhier believes that this adherence takes place through the intervention of a groove, the concavity of which looks downwards and backwards, and facilitates the communication between the ovary and the cavity of the tube. All the fringed folds are attached to a small circle which is more contracted than the part of the tube which it terminates. This small circle is called the *external orifice of the tube*. The *internal* or *uterine* orifice is the name given to the one by which it opens in the uterine cavity.

[The Fallopian tubes are composed of three layers: an external or serous, a middle or muscular, and an internal or mucous layer.

The external layer is a part of the peritoneum which lines the entire length of the oviduct, and is extended to the free edge of the fimbriated extremity, where it ends abruptly.

The middle layer is composed of two planes of muscular fibres — the external being longitudinal, and the internal circular. The tubes have often been described as prolongations of the uterus, whereas M. Robin regards them as entirely distinct. A thin, cellular septum is, in fact, interposed between the tissues of the two organs, allowing of their separation by the scalpel.

The mucous layer is continuous internally with the uterine mucous membrane, and terminates externally upon the free edge of the fimbriated extremity where it is connected with the peritoneal layer. Thus affording the only example of a mucous membrane in continuity with a serous one.

The mucous membrane of the oviduct is devoid of papilli and glands, but presents longitudinal folds so adjusted to each other as to transform the canal into numerous capillary tubes, well adapted to convey readily the spermatic fluid to the ovary. The mucous membrane is also covered with a vibratile epithelium, the motion of whose cilia being directed toward the uterus are, doubtless, intended to impel the ovule toward the uterine orifice of the tube.]

A special artery, derived from the numerous branches with which the uterus is supplied, and two veins, which join the ovarian veins, constitute the vascular apparatus of the tube. It is provided with nerves from the spermatic and hypogastric plexuses.

The Fallopian tube serves the double purpose of a canal for transmitting the fecundating principle of the male, and for carrying the germ furnished by the female from the ovary to the uterus.

The use of the fimbriated extremity is to embrace the ovary at the moment of fecundation, and probably also at each menstrual period, and to apply itself over the point from whence the germ is detached. At this time, the vessels of the Fallopian tubes are engorged—the mucous membrane assumes a well-marked red color—the walls are thickened, and the canal is enlarged. The tubes are at the same time affected with peristaltic contractions, which are probably intended to propel the ovule into the uterine cavity.

The anomaly presented by the existence of supernumerary pavilions, or fimbriated extremities, upon the same tube, as described by M. Gustave Richard, is here deserving of notice. In the bodies of twenty women, selected at random, he observed it five times. One or several of them were found attached to the tube either immediately behind the normal fimbriated extremity, or at distances varying from three-quarters of an inch to an inch and a quarter beyond it; all of them were formed like the one which terminated the oviduct by the fringe-like division of the mucous membrane. By floating the fringes under water, an opening was discovered conducting into the tube, through which a stylet might be introduced and brought out through either the internal or external orifice of the tube.

According to Dr. Hamilton, of Edinburgh, the Fallopian tube undergoes some modification during gestation, to which he attaches great importance, as a characteristic sign of pregnancy. This change consists in the formation of a little pocket, or sac, about an inch from the fringed extremity. This partial dilatation of the tube, previously described by Roederer under the name of *antrum tubæ*, is certainly an exceptional fact. I have never observed it; and M. Montgomery has encountered it but once in fourteen uteri, examined in the state of gestation; so that it cannot have all the importance that certain authors wish to ascribe to it.

ARTICLE IV.

OF THE OVARIES.

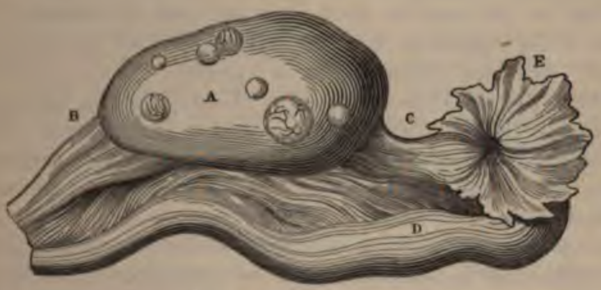
The ovaries (*testes muliebres*) are the analogues, in the female, to the testicles of the male: that is, both of them secrete a product indispensable to reproduction. Two in number, they are situated on the sides of the uterus, in that portion of the broad ligament called the posterior wing, just behind the Fallopian tube. They are maintained in position by those ligaments, as also by a special one, denominated the *ligament of the ovary*.

The ovaries vary in situation, according to the age of the individual, and the state of the uterus. In the fœtus, they are placed, like the fundus uteri, in the lumbar region; but, during gestation, they rise into the abdomen along with the body of the uterus, upon the sides of which they lie.

Immediately after delivery the ovaries occupy the iliac fossæ, where they sometimes continue throughout life; again, it is not at all uncommon to find them turned backwards, and adherent to the posterior face of the womb.

The ovaries vary in size, both from age, from the plenitude or vacuity of the uterus, and from health or disease. Being proportionably larger in the fœtus than in adult age, they diminish after birth, augment in volume at puberty, especially at the monthly periods, and dwindle away in old age. During pregnancy and after delivery, they acquire in some cases quite a considerable volume.

FIG. 29.



Ovary of the Young Female after Puberty.
A. Body of the ovary. B. Utero-ovarian ligament. C. Tubo-ovarian ligament. D. Fallopian tube. E. Fimbriated extremity of the tube.

Before the age of puberty, the external surface of the ovaries is of a light rose color, and is smooth and free from inequalities. In women who have menstruated for several years the surface is rough, fissured, covered with small blackish cicatrices, and sometimes with ecchymotic spots. Some of these cicatrices are linear, others are triangular or radiated; they are of a red color when recent, but become brown in the course of a few months. Sometimes a complete union fails to take place between their edges, leaving a small opening, which communicates with the ruptured cavity. After the period of life at which the menses disappear, the external surface presents numerous wrinkles, which are not, as has been supposed, the result of old cicatrices, but are due simply to the atrophy of the ovaries, and the plication of the external envelope which is the consequence.

The ovaries are ovoidal in shape, a little flattened from before backwards, and of a whitish color.

The external extremity of the ovary is adherent, as we have said, to one of the fringes of the fimbriated extremity of the Fallopian tube; the internal extremity is attached to the uterus by the ligament of the ovary, which is inserted at the corresponding angle of that organ.

The ligament of the ovary, which we have already considered, was for a long time regarded as a canal, designed like the Fallopian tube to convey the fecundated ovule into the cavity of the uterus; modern anatomy, however, proves it to be solid.

From the researches of Gartner, of Copenhagen, and of M. de Blainville, it appears that in some quadrupeds, and especially the sow, a canal is almost always to be found extending from its external orifice by the side of the meatus urinarius (corresponding with a similar orifice on the other side of the meatus), through the substance of the muscular fibres of the vagina to the neck of the uterus; here the canal becomes narrower, but continues on, following the body of the uterus and imbedded in its fibrous structure, and finally leaves it to pass in a direction parallel to the corresponding angle into the substance of the broad ligament.

M. Follin found, whilst injecting the duct of Gartner in the sow, that he injected at the same time a long tortuous tube, situated in the substance of the ligament, at the point occupied in the human female, by the collection of glandular tubes which I have described. I have been able to determine the fact that in the sow this duct does not open by a large orifice at the lower part of the vagina, as has been represented, but in reality by a very narrow one. It is not terminated at its entrance into the broad ligament by a few brush-like divisions, as stated by M. de Blainville, but is continuous with a very fine tortuous tube which extends to the external extremity of that ligament. The duct of Gartner is furnished internally with a pavement epithelium, and communicates throughout its course with many glandular tubes finer than itself. (Follin.)

We have sought for this duct of Gartner in the human female, but found nothing which could be reconciled with the description given by him of it; however, we cannot avoid remarking that since these researches N. C. Baudelocque has observed in a woman a canal which seemed to be produced by a bifurcation of the Fallopian tube, and which, after passing through the entire uterine walls, opened into the upper part of the vagina, near the neck of the womb. Madame Boivin and some others have met with a similar canal, and Mauriceau and Dulaurens considered it of quite frequent occurrence.

The arteries which supply the ovary are the spermatics, and proceed directly from the aorta.

The numerous small venous branches found in the ovary unite below the organ so as to form a plexus which gives origin to the ovarian veins; the latter emptying into the vena cava inferior, and into the renal vein.

The numerous lymphatic vessels with which it is provided contribute to the formation of the spermatic plexus, which itself empties into the lumbar plexus, and thence passes to the thoracic duct.

The nerves are derived from the great sympathetic.

§ 1. STRUCTURE OF THE OVARIES.

[The ovary consists of a special parenchyma inclosed by two envelopes, one of which is serous, the other fibrous.

The serous envelope is formed by the peritoneum and is closely attached to the subjacent one. It covers the entire gland except at its lower edge, where the two layers of peritoneum separate to allow passage for the vessels and nerves distributed to the ovary.

The fibrous envelope corresponds with the peritoneum by its external surface, whilst its internal surface is blended with the glandular parenchyma. It is much thinner than the tunica albuginea of the testicle with which it has been compared. M. Sappey even denies its existence, and regards the peritoneum as the only envelope of the organ; his opinion, however, is not yet adopted by most anatomists.

Within the envelopes mentioned, is a special tissue of a grayish-white color, termed the *stroma*, which is formed in great part by the interlacement of muscular fibres, some of which are peculiar to the ovary, whilst others are but a prolongation of the same kind of fibres as constitute the ligament of the organ. Other fibres take their origin from the Fallopian tube. The existence of all these fibres was shown by M. Rouget in 1858. With the muscular fibres are mingled others of connective tissue.

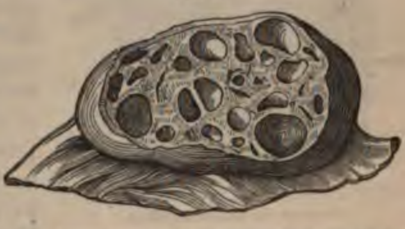
The arteries are situated between the muscular fibres, are flexuous, and have a spiral form. The veins, contorted in like manner, form a rich network which empties into a venous plexus immediately below the ovary. The arteries and veins, surrounded as they are by muscular fibres, form a true erectile organ, and the ovary is regarded as such by M. Rouget.

Within the fibrous structure of the stroma exist small cavities, called *ovisacs* or *Graafian vesicles*, of a size varying ordinarily from that of a millet-seed to that of a hemp-seed. Some of the more developed vesicles project from the surface of the ovary, where they acquire, as we shall see hereafter, a comparatively large size.

About fifteen or twenty vesicles may be readily distinguished in the adult female, but with the microscope many more are observable, all of which will be developed when the first shall have disappeared.

The ovisacs have hitherto been described as distributed through the substance of the ovary at different depths, and as approaching the surface as they increased in size. Kolliker had, indeed, observed that the Graafian vesicles occupied chiefly the peripheral portions of the gland, but M. Sappey deserves the credit of having determined clearly their true position. Having examined his preparations illustrative of the structure of the ovary, kindly shown me by this skilful anatomist, no doubt on the subject is left in my own mind, and I can vouch for the correctness of the following description.

FIG. 30.



This figure represents a longitudinal section of the ovary, showing the arrangement and different degrees of development of the Graafian vesicles.

According to M. Sappey, a complete section of the ovary made perpendicular to the surface, will show the stroma to be composed of two distinct parts.

1. Of a central portion, of a reddish color and spongy texture, manifestly composed of the stroma as just described. The bulk of this portion is considerable, forming almost the entire mass of the ovary, and containing no Graafian vesicle.

2. Of a superficial portion, of a white color, firm consistence, and homogeneous appearance, spread over the central portion. In this peripheral layer are situated exclusively the ovisacs and ovules; it may, therefore, be termed the ovigenic layer. It is about the one twenty-fifth of an inch in thickness.

The ovigenic layer is composed of the fibres of the stroma, amongst which are found Graafian vesicles in abundance.

M. Sappey's microscopical examinations have shown that in one healthy ovary of a woman of from eighteen to twenty years of age, the number of ovisacs and ovules is more than 300.00, making near 700,000 for the individual. He therefore calculates, that if all the ova existing in the surface of the ovaries of a young woman were to be fecundated and undergo all their phases of development, it would require but one woman to populate four such cities as Lyons, Marseilles, Bordeaux, and Rouen, and but two, to furnish inhabitants for a capital like Paris, containing 1,600,000 souls.

There are as many ovisacs in the fœtus as there will be at puberty, but as the gland is then small, the vesicles conglomerated, but separate as the ovary develo After puberty, the number of ovisacs lessens; in old women they disappear.

§ 2. Of the Ovarian Vesicles.

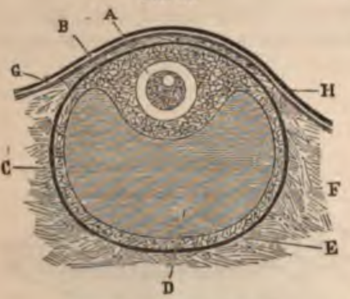
From birth to puberty the Graafian vesicles undergo no change. They have rounded form and a diameter of $\frac{1}{1250}$ of an inch. At puberty some of them ha become developed, and, as stated, have attained the size of a millet-seed, of a hem seed, or even of a pea.

Each vesicle adheres firmly to the substance of the stroma in which it is lodge and which forms for it a sort of retractile tegument. The special structure of eac ovisac consists: 1, in a capsule or envelope; 2, of a contained body or nucleus.

1. The capsule or envelope is formed of a special, transparent, extremely thin but resisting, non-contractile membrane. It is vascular and forms the vesicle containing the nucleus.]

2. *The Nucleus.*—The parts entering into the composition of the *nucleus* are: 1st, a granular membrane which incloses the humor of the Graafian vesicle; and 2d, a liquid produced by the aggregation of three humors of a different aspect, viz., a limpid mucosity, clear, though a little oily, a number of small rounded granulations, transparent in their central cavity, and slightly opaque at their periphery, and some oil globules. 3d, and lastly, an ovule floating in the midst of this liquid.

Fig. 31.



Ovule in the Graafian vesicle.

A. Ovule. B. Cumulus granulosus. C. Granular membrane. D. Cavity of the Graafian vesicle. E. Membrane proper of the ovisac. F. Stroma of the ovary. G. Fibrous envelope of the ovary. H. Peritoneal layer of the ovary.

The *Granular Membrane* (see Fig. 31, G′).—A delicate membrane is found applied on the internal face of the Graafian vesicle, formed of granules, or rather of cellules, and bearing the name of the *granular membrane.* It tears with great facility, from its extreme tenuity; and hence many authors have denied its existence. Upon one part of the membrane (that corresponding to the free side of the vesicle) the granulations, or cells producing it, are more numerous or more compact, and in the centre of this compact mass, which has been called the *proligerous disk*, the ovule is found.

The granulations, constituting the proligerous disk (see G, Fig. 31), are so closely united both with each other and with the latter, that upon opening the Graafian vesicle, even where the granular membrane is destroyed, this portion remains adherent to the ovule, forming round it, as it were, a granular bed. This membrane is entirely destitute of vessels.

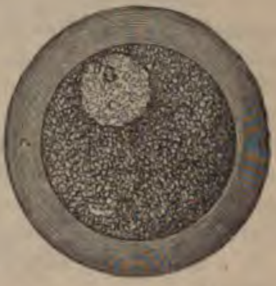
§ 3. The Ovule.

Since the labors of Graaf, the majority of authors agree with him, that the ovule is constituted by the vesicle just described; but the honor of having first discovered the ovule, as a distinct organ in this vesicle, belongs to Charles Ernest Baër. The ovule is completely formed in the ovary during the earlier years of life. It is imbedded from the period of its maturity, as stated above, in the midst of a mass of granulations, which are more compact than those which fill the remainder of the vesicle.

It therefore occupies a fixed position in the vesicle, and is almost constantly met with at a point opposite to that whence the large vascular trunks spread out upon the ovarian capsule, that is to say, at the point which projects from the surface of the ovary. When examined with a lens, it appears as an opaque rounded body, at least more opaque than the liquid inclosed in the same vesicle; it is extremely minute, although the diameter of the little sphere it represents is subject to variations.

"The largest human ovules I have seen and manipulated," says Bischoff, "did not exceed the tenth of a line, being barely perceptible to the naked eye." When placed under a microscope, it is seen to consist of an exterior envelope, called the *vitelline membrane* (Coste), *transparent zone, cortical membrane*, or *chorion* (Baër), of a substance aptly compared to the yolk of an egg, and designated as the vitellus, and of another vesicle (placed within the latter) called the *germinal vesicle*.

Fig. 32.



A Non-fecundated Human Ovule.

A. The vitelline membrane, or transparent zone. B. The vitellus, or yolk. C. The vesicle of Purkinje, or the germinal vesicle. D. The germinal spot.

A. *Vitelline Membrane.*—If the ovule be examined by a magnifying glass of sufficient power, an obscure sphere will be brought into view, surrounded by a large clear ring, the nature of which it is difficult to make out. M. Coste has given the name of the vitelline membrane to this ring. It is evidently a thick membrane, the external and internal outlines of which assume the appearance of two circular lines inclosing a transparent ring. Many persons have merely considered it as a layer of albumen surrounding the yolk, but any one may easily convince himself that it is at least a resisting membrane, by cutting the ovule, or by compressing it by means of an instrument called the compressor; "for after proceeding in this manner," says Bischoff, "there cannot be a doubt that the transparent zone is an elastic, thick, hyaline, and transparent membrane, without a determinate texture."

Though entirely destitute of cells and vessels, it is nevertheless a living envelope; because, as soon as the ovum in the mammalia arrives in the cavity of the uterus, it becomes the seat of an active vegetation, and produces villosities which are more or less ramified. The latter, as they become developed, insinuate themselves into the tissue of the uterine mucous membrane, and thus attach the ovum to the place which it is to occupy for the future.

B. *Yolk or Vitellus.*—The cavity of the vitelline membrane is occupied, in great measure, by a granular liquid, that does not adhere to the exterior envelope, and even escapes from it readily when the latter is broken.

According to Bischoff, the yolk of a human ovum is formed of a coherent, indistinctly granular, transparent, and viscous mass, which does not run out when the egg is cut or crushed; each portion of the zone reserving its particular segment or yolk, or the latter escaping altogether.

"In certain cases," says he, "the vitelline granulations are not united in a single mass. I have seen the yolk divided in two, and, on one occasion, into five parts of different volume."

The vitellus usually fills the interior of the zone completely, and has the same form, but sometimes the vitelline sphere is smaller than that destined to receive it. Some authors likewise believe that a very delicate membrane exists, which incloses and unites the yolk in a single mass; but Messrs. Coste and Bischoff agree in rejecting the existence of this, and contend that the granulations of the vitellus are placed in juxtaposition with the transparent zone, which forms its sole and only envelope.

C. *Germinal Vesicle.*—In the midst of the vitellus, in very young girls, or on one of the neighboring points of the peripheral envelope in the matured ovules, a small, perfectly transparent, and colorless vesicle is seen like a clear spot, surrounded by a mass of a deeper yellow. Purkinje had described it in the eggs of birds, and gave his own name to it; but M. Coste is entitled to the honor of having first demonstrated its existence in the ovum of mammiferæ, and of thus having established the perfect identity between the latter and the eggs of birds. This is the vesicle of Purkinje, or the *germinal* vesicle. It is slightly oval, and consists of a very delicate, transparent, and colorless membrane, which incloses a liquid that is frequently as limpid and transparent as itself, though it sometimes contains a few granules. Notwithstanding its extreme tenuity, this vesicle still offers a certain consistence, since it has been seen intact, after leaving the ovule, and being completely separated from the granular liquid in which it was placed.

It is always very small, and scarcely measures the sixtieth of a line in diameter.

D. *The Germinal Spot.*—If the germinal vesicle be attentively observed, an obscure rounded spot will be seen on some part of its periphery; this was first discovered by Wagner, who gave it the name of the *germinal spot.* It seems to be formed by the aggregation of fine small granules, or little globules, the obscure hue of which is brought out by the clear contents of the vesicle. Wagner has sometimes met with two, or even more, germinal spots in the mammiferæ.

Before fecundation, therefore, the ovule is composed: 1st, of an exterior envelope, the vitelline membrane, or transparent zone; 2d, of a vitellus, or yolk, contained in this vesicle; 3d, of a little vesicle inclosed in the first and swimming in the vitelline fluid—the germinal vesicle; 4th, and lastly, of the germinal spot.

EXPLANATION OF PLATE I.

ANTERO-POSTERIOR SECTION OF THE FEMALE PELVIS, OF THE GENITAL ORGANS, AND OF THE DEFECATORY APPARATUS.

(*Taken from M. Richet's Treatise on Surgical Anatomy.*)

The soft parts of the lesser pelvis and the contained organs have been previously fixed by two very sharp metallic rods, one of which is passed above and the other below the symphysis pubis and made fast in the vertebræ. An examination of the drawing will show that the section is slightly oblique from the median line in front, toward the right side behind. In other words, it has been so made that the instrument after having divided the pubic symphysis in front, falls outside of the right sacro-iliac symphysis.

belong to a pregnant female. If the circumvolutions are but feebly united, having between them a layer of plastic matter which serves as a medium of adhesion, the corpus luteum corresponds to the second month of pregnancy; if, on the contrary, the circumvolutions are blended into a compact mass, preserving at the same time a size similar to the preceding, it may be regarded as derived from a woman who had died toward the end of the third month of gestation.

From this time the mass becomes more and more compact, remains stationary for a while, and then tends to decrease until the end of gestation.

We have represented in the same plate, several corpora lutea resulting from menstruation, together with others observed at a more or less advanced period of pregnancy. By comparing the physical differences presented in the two cases, we may readily appreciate the truth of the observations just stated. For Figures 3, 4, 5, and 6, I am indebted to the kindness of my learned master, M. Rayer.

EXPLANATION OF PLATE II.

Fig. 1. *a a.* Corpus luteum four weeks after menstruation.

Fig. 2. Corpus luteum thirty days after menstruation.

Fig. 3. Represents the ovary of a young woman, who, after passing the night with her lover, committed suicide by throwing herself from the third story; death took place twenty-four hours after. *a.* Small rupture produced by the bursting of the vesicle.

Fig. 4. Longitudinal section of the same ovary showing the interior of the vesicle.

Fig. 5. Represents the ovary of a non-primiparous woman, who died in the fifth month of pregnancy, of pneumonia complicated with abortion.

Fig. 6. Ovary of a woman twenty years of age, who died in the ninth month of gestation.

In reviewing the facts whose history we have just traced, we see that towards the age of puberty, the ovary becomes the seat of an active congestion, and, it might be said, of a new vitality; all the living powers of the organ seem to be concentrated upon one of the Graafian vesicles, which suddenly assumes a considerable development, and in so doing, raises the envelope of the ovary, and forms a tumor, which is superadded to the organ. The walls of the vesicle become weaker and weaker as their distention increases, until they finally give way; in consequence of the rupture, the ovule is expelled and carries with it a portion of the granular fluid with which it was surrounded. This expulsion constitutes the phenomenon known of later time as spontaneous ovulation. The void left in the vesicle is soon filled with blood and a gelatinous matter which is secreted by the walls of the follicle; the latter becomes hypertrophied and [illegible] by the [illegible] of the [illegible], and thus constitutes the corpus luteum.

[illegible] phenomena, it is known that the uterus and its [illegible] [illegible] [illegible] the [illegible] [illegible] and [illegible] [illegible] [illegible] [illegible] when they present [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] first [illegible] in the great [illegible] parency, on account of the hemorrhage which ensues. This is sometimes limited to the production of small extravasations upon the as yet entire walls of the vesicle, though most frequently a true effusion takes place within the cavity. The effused blood and the superabundant secretion increase still more the distention of the walls, which is finally carried so far that rupture becomes imminent, and it is possible to distinguish at the most projecting part of the tumor, the point where it is about to ensue. This point is generally indicated by a small reddish spot, of about a line in extent, produced by a strong injection, or even by a slight effusion of blood in the texture of the walls of the vesicle. (Raciborsky.) The thinned walls finally give way and tear gradually; the membranes of the vesicle itself being the first to yield, and after them the peritoneal layer. As a consequence of this rupture, the ovule is expelled, and carries along with it a part of the granular contents of the vesicle; it enters the Fallopian tube, the fimbriated extremity of which is prepared to receive it, and after traversing its canal arrives at a later period in the cavity of the uterus.

FIG. 33.

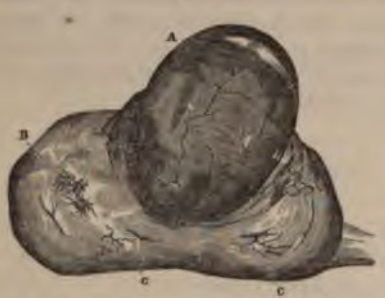


FIG. 34.

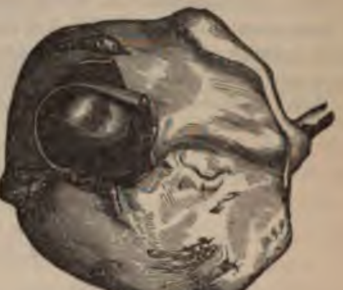


FIG. 33. Showing the ovary, and a Graafian vesicle at its highest degree of development, and just before its rupture.[1]

A. The hypertrophied vesicle (drawn from nature, and of its real size). B, C, C. Radiated cicatrices, left by previously ruptured vesicles.

FIG. 34. The ovary, with the ruptured vesicle and the large clot that fills its cavity. (Drawn from nature.)

The walls of the follicle collapse after the rupture, and its cavity becomes filled with a small quantity of blood, which is found fluid or coagulated according to the time at which the examination is made.

The walls of the torn vesicle contract gradually, and the clot, which sometimes at first is the size of a small cherry, is slowly absorbed; the originally spacious cavity diminishes, the margins of the rupture approximate, so as even to become united occasionally by cicatrization, and order is finally restored.

The evolution just described, which is terminated by the rupture of a vesicle and the spontaneous expulsion of an ovule, is not an isolated face; on the contrary, it excites numerous sympathies in the remainder of the generative apparatus and throughout the organism of the female. We shall first study the generative organs and the modifications which they undergo before, during, and after this evolution.

---

[1] This figure, borrowed from M. Raciborsky, is the exact copy of a preparation which he had the kindness to show me. But since that time (1843) I have never met with so enormously developed a vesicle, and I am disposed to believe that this great size is rather pathological than normal.

The *ovary*, which produces the hypertrophied vesicle, is notably enlarged. It is of a deep red color, and its vascular apparatus is remarkably congested.

The *Fallopian tube* itself shares in the congestion, being often of a violet-red color, especially at its fimbriated extremity, which has a sort of velvety appearance. It is also endowed at this time with a special erethism, in virtue of which it applies its floating extremity upon the ovary, in such a manner as to receive the ovule and conduct it into its cavity.

The *uterus* undergoes such important changes that, before the discovery of spontaneous ovulation, it was erroneously supposed to play the principal part in the phenomena which we are about to study. I shall continue to draw from the beautiful works of M. Coste, from which I have already borrowed so freely in the preparation of this chapter, the principal features of the ensuing description.

Whilst the ovarian vesicle is undergoing the rapid evolution which we have just described, the vascular apparatus of the womb becomes developed and injected in an unusual manner; immediately beneath the delicate layer of epithelium which covers the surface of the mucous membrane, it forms in particular elegant reticulations, with irregular, lozenge-shaped intervals, surrounding the orifice of each of the numerous glandular tubes of which this membrane is almost entirely composed. This network is so fine as to give a violet hue of greater or less intensity to the internal surface of the womb, and is formed of very delicate venous ramuscules. The utricular glands increase perceptibly in size, and the muscular structure of the uterus, in consequence of the congestion which it undergoes, acquires greater extension, is of a more lively red color, and becomes more spongy and supple. The entire volume of the organ is increased, the neck is tumefied and its orifice narrower; the lips of the os tincæ are warmer and their color deeper.

The mucous membrane, in consequence of this development of its vessels, and especially of the glandules of which it is composed, has its thickness so much increased in proportion to the size of the uterine cavity, as to be thrown, in a great many subjects, into soft, projecting folds or circumvolutions, which are so pressed together as to leave no vacant space in the cavity of the organ. M. Coste has several wombs in his possession, whose mucous membranes measure at certain points, from two to three-eighths of an inch in thickness; still, to whatever degree the hypertrophy may be carried, it never presents the floating villi which Baër and Weber thought they had observed; neither, except in some pathological cases, does it ever exhibit the pseudo-membranous exudation which is acknowledged by almost all physiologists. (See *Deciduous Membrane*.)

This great vascularity of the mucous membrane, and the high vascular congestion which the entire organ undergoes, is at first accompanied with the exudation of a few drops of blood, which by admixture below with the vaginal mucus, which is itself at this period increased both in quantity and fluidity, communicates to it at first a rosy, and then a light reddish hue.

this succession of physiological acts, and the series of phenomena which comparative physiology and anatomy have shown to take place in mammalia at the rutting season. In them likewise, the approach of the male is not necessary to the discharge of the ovule, and the spontaneous ovulation is accompanied with almost identical changes in the genital organs, and manifests its influence upon the entire organism by the same assemblage of phenomena. In the human female, as in the mammalia and birds, the spontaneous ovulation, accompanied with the same cortége of symptoms, occurs at more or less regular intervals. In the rabbit, it is the tumefaction and almost varicose injection of the vessels of the vulva. To this coloring and tumefaction is added, in the bitch, an odorous secretion, which allures the males, and puts them upon the track of the females. Finally, in monkeys, a more or less abundant hemorrhage occurs, which, in the case of the macaquæ and the cynocephalæ, coincides with so monstrous a swelling of the vulva, that, in certain cases, the surrounding parts are infiltrated as though inflamed in consequence of the sting of bees. We shall study hereafter the peculiarities of these returns in the human species.

The vesicular evolution, accompanied with the array of phenomena just described, is reproduced at intervals which vary for different animals, but in the human female recurs at much shorter periods. Every month, in fact, in the normal condition, a new Graafian vesicle is found to increase in size, to become excessively distended, and finally bursting and discharging the ovule, to become the seat of the successive transformations presented by the corpus luteum. Every month, therefore, this curious phenomenon of spontaneous ovulation is renewed; and the dark-colored cicatricules of various form, which are observed upon the surface of the ovary of nubile women, give rise to the supposition exclusive of direct observation, that the operation of which they are the consequence must have recurred a great number of times.

Of the phenomena which we have just described, the flow of blood had, until of late years, chiefly claimed attention. This flow, as well as the vesicular evolution of which it is the consequence, occurs for the first time between the ages of twelve and fifteen years, and is afterward periodically renewed every month until the time of life at which the female loses her aptitude for fecundation, that is to say, until she attains the age of from forty-five to fifty years. Known under the names of the *monthly sickness*, the *monthlies, courses*, &c., this periodical excretion constitutes *menstruation;* a phenomenon which, though doubtless of importance, is nevertheless far from being the capital fact amongst those which we have studied, for it may be absent, without the vesicular changes being notably affected thereby, whilst, on the other hand, it never appears without having been preceded and accompanied by the development of a Graafian vesicle. It is therefore a secondary phenomenon intimately connected with those which are accomplished in the ovary. The details into which we are about to enter, in reference to menstruation, will complete the history of the ovarian follicles.

this body may exist in a virgin girl, provided she has previously menstruated.

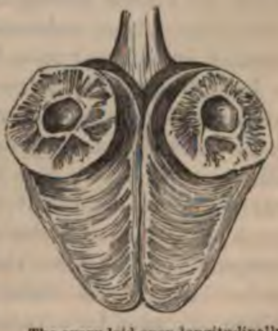
Very different opinions have been promulgated as to the mode of formation of the yellow body, as also in regard to the precise period at which it commences. According to Robert Lee, the mass of this body is formed exteriorly, around the empty capsule of the vesicle, and consequently it has intimate connections with the ovarian stroma; but this opinion is inadmissible.

From the observations of Baër and Valentin, the yellow body results from the hypertrophy, or a kind of puffing up, of the membrane of the vesicle, which throws out a species of vascular processes that serve to fill up the whole cavity of the follicle, excepting at the part occupied by the ovule. In the latter view, as well as in that entertained by Montgomery, the development of the corpus luteum will aid in rupturing the vesicle, by the distention it produces, and will soon after determine the expulsion of the ovule, by pressing it gradually towards the thinnest part.

Both suppose that the *corpus luteum* is completely developed when the vesicular rupture and the discharge of the ovule take place, which, however, appears altogether inadmissible to me. I am convinced to the contrary, from the specimens which M. Raciborsky has had the kindness to show me. In a female, who died during menstruation, I was enabled to prove the recent rupture of a vesicle that was very much hypertrophied; its cavity, however, did not contain a yellow body. This does not, therefore, precede the rupture of the vesicle. In my opinion, M. Raciborsky has perfectly described the phenomena, consecutive to this rupture, in the interesting treatise published by him (*De la Ponte Periodique chez les Femmes et les Mammifères*, 1844). It may prove useful to publish his views in this work.

"If the ovaries be examined eight, ten, or twelve days after the cessation of the menstrual discharge, a small, rounded tumefaction, surmounted by a red spot like an ecchymosis, and presenting in its centre a slight linear fissure, will be found on the surface of one of these organs. The margins of the fissure are agglutinated, even this early, in the majority of cases, but it is still easy to separate them by using lateral tractions. If the ovary be then opened at the ecchymosed spot, the interior will exhibit a pouch, already smaller than the cavity of the vesicle before the rupture, but entirely filled by a clot of blood, which, when placed in alcohol, has the consistence of a solid body, though somewhat spongy in its nature. The clot is usually about the size of a medium cherry (see Fig. 34), and may be raised from its cavity without difficulty. The parietes of the vesicle exhibit, at this period, a yellowish hue, that disappears in spirits of wine. The surface of the membrane is at once slightly plaited and downy. In the meanwhile, the most soluble molecules of the clot are absorbed, and then a further retraction of the tunic takes

FIG. 36.



The ovary laid open longitudinally, and showing the corpus luteum at a certain stage of its development.

place. Being continually forced to follow the diminution of the clot, and to become moulded upon it, it forms anew a certain number of folds, which finally adhere to each other, and thus diminish the surface of the membrane. Afterwards, a new absorption of soluble parts, a further retraction of the tunics, a fresh diminution of the cavity, &c., &c. Whence, at the end of a month, the only remnant of the pouch, that could once have contained a small cherry, is but a little spot, that would hardly inclose its stone." (See Fig. 36.)

The tunic of the vesicle becomes hypertrophied whilst undergoing the forced plaiting, caused by the incessant retraction of the peripheral fibres, thus constituting a radiated mass, which, from the imbibition of the coloring principles of the blood, assumes a very characteristic orange-yellow color.

This coloration is not produced, as M. Montgomery and several others supposed, from the deposit of a substance of a new formation, either externally to, or within the vesicle, or between the two tunics that constitute its walls, but is simply the result of imbibition. Finally, the absorption of the clot being complete, the two opposed walls of the pouch, in time, approach each other, and thenceforth form merely a single slate-colored line. The vesicular cavities are reduced to this condition in from four to six months.

Both M. Coste and M. Raciborsky acknowledge the folding of the membrane of the vesicle, but the theory of the former in relation to it differs so much from that of the latter as to make it our duty to explain it briefly.

Immediately after its rupture, the ovarian follicle becomes filled with a gelatiniform matter, which often receives a *red color* from the blood which escapes from a few opened vessels; the matter itself assumes at a later period a greater consistency. By the spontaneous retraction of the walls, as we have already explained, they are promptly thrown into folds, and the rugæ which result from retraction are so numerous, so prominent, and so compact, as to bear some resemblance to the circumvolution of the brain. (See Fig. 37.) Contemporaneously with this folding, the wall becomes hypertrophied and inflamed; it assumes a red color, and encroaches more and more upon the cavity which it finally fills, just as though it had given rise to granulations. Ere long, however, the plastic matter which at first filled the follicle, having been gradually absorbed, the juxtaposed circumvolutions contract intimate adhesions with each other, and the replete follicle forms a large tumor upon the surface of the ovary.

Long before the folds or circumvolutions which tend to fill up the cavity of the ruptured follicle are so tumefied as to come in contact, their tissue loses the inflammatory redness which it at first possessed. But as M. Coste does not recognize the formation of a clot of blood in the vesicular cavity, he cannot admit with M. Raciborsky that the yellow hue of the mass just described is due to the imbibition of its coloring matter. On the contrary, he considers the color to be due simply to the nature of the molecular granules which enter into the structure of the internal layer. These granules, he says, are remarkable not only from their number, but on account of their light yellow hue. Therefore, as after the folding of the internal tunic, they are both very numerous and very compactly bestowed, the yellow tinge, which is very light for each taken separately, becomes deep for the entire mass.

The two opinions may therefore be recapitulated thus: 1. Effusion of a coagulable fluid, which is blood, according to M. Raciborsky, and plastic lymph, according to M. Coste. 2. Folding, and progressive hypertrophy of the wall of the vesicle. 3. Yellow coloration of the latter, either by the coloring matter of the blood (Raciborsky), or by the condensation of the molecular granules (Coste). These two theories, which include nearly all the others, yet differ upon an important point. According to MM. Raciborsky, Pouchet, Dalton, &c., there is at first an effusion of fluid blood, which soon forms a clot of greater or less density; M. Coste, on the contrary, regards this effusion of blood as pathological, or, at most, as an exceptional occurrence.

[Most physiologists now think that after its rupture, the cavity of the Graafian vesicle becomes filled with a plastic secretion sometimes tinged with blood; the formation of a clot being an exceptional occurrence. While this secretion is being formed, the muscular fibres of the stroma retract and compress the wall of the ovisac, which not being retractile, is thrown into folds, as has been said. Some of the cells of the granular membrane which remain adherent to the internal surface of the ovary undergo hypertrophy, and fatty granules are produced which give a yellow color to the tumor. The folds project more and more and finally become adherent. Then, after having remained stationary for a certain time, this corpus luteum becomes atrophied and gives place to a depressed cicatrix. In short, M. Coste's theory would seem to be the true one, whilst the phenomena described by Raciborsky, though real, are exceptional and pathological.]

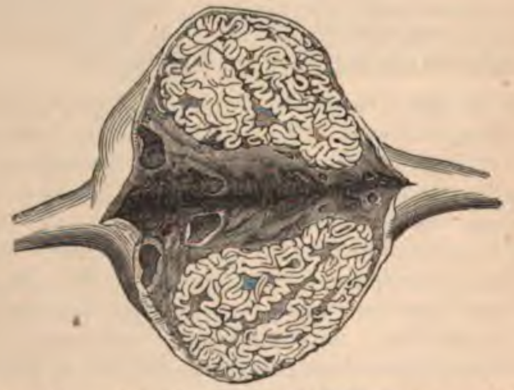
Whatever be the fate of the ovule after its expulsion, whether it receives, or not, the vivifying influence of the seminal fluid, the remains of the torn capsule always undergo the primary changes described above.

As the formation of corpora lutea always follows the rupture of a Graafian vesicle, and as this rupture is most frequently spontaneous, it is evident that medical jurists have committed an error in regarding their existence in the ovary as a *certain* indication of an anterior fecundation; but some modern physiologists have also been wrong in supposing that the study of the corpora lutea could have no medico-legal importance whatever; for, although the supervention of pregnancy modifies the corpora lutea in no respect at the commencement of their formation, it exercises an incontestable influence upon their ulterior development. M. Coste, who has followed their evolution step by step in the two cases, has derived from his attentive observation sufficient means of distinguishing a corpus luteum succeeding to a pregnancy, from one pertaining to a female who has not conceived.

Not less than a month, says he, is required in a *pregnant woman* for the filling up of the follicle, and the commencement of adhesion between the folds; and forty days, nearly, will have elapsed, before the connections are firmly established. At this time, their assemblage forms a compact and resisting tumor, of nearly an inch in its longest diameter, and five-eighths of an inch in its shortest. Having thus arrived at its maximum, it remains stationary for some time, until toward the end of the third month its period of diminution commences. The tumor is gradually absorbed, loses its volume, and seems to enter again into the organ upon the surface of which it had been raised; at the same time it becomes more compact, denser, and more shining. In the course of the fourth month it is nearly one-third, and towards the end of the fifth, nearly one-half smaller. From the sixth to the ninth month it will have lost nearly two-thirds of its volume; still, however, it forms after labor a tubercle of not less than five-sixteenths of an inch in diameter. The latter now diminishes with considerable rapidity, but nearly a month is required for its reduction to a small and hard nucleus of indefinite duration. There is nothing absolute, however, in the rate of retrogression of this phenomenon. For, as in some women who died between the sixth and eighth month of their pregnancy, the corpora lutea were found as voluminous as in others at the fourth month, so evident traces of it may sometimes be discovered several months after labor.

When the corpus luteum is produced under other influences than those to which impregnation gives rise, its development, adds M. Coste, is by no means so great, and its rate of diminution is more rapid. Whilst, for example, from five to six months are required for the completion of the chief modifications during pregnancy, the capsules are almost entirely effaced in from twenty-five to thirty days, in women who have not been impregnated. The phenomena presented at the commencement, in the last case, are the same as in the former, but the vesicles suddenly soften, and are frequently entirely absorbed before the circumvolutions of the internal layer have acquired sufficient development to come in contact, or to contract adhesions. M. Coste has never known the corpora lutea of a non-pregnant female, who had died suddenly, to resemble those observed in the second or third month of pregnancy; they have neither the size nor the density of the latter (Fig. 37). In a word, adds the learned embryologist, a corpus luteum which is as large as the ovary itself, which forms a solid and resisting tumor, exhibiting upon section the capsule of the ruptured vesicle filled with the strongly-adherent internal circumvolutions, must

FIG. 37.



Represents a corpus luteum derived from a female who died in the sixth month of pregnancy.

This book is the property of
COOPER MEDICAL COLLEGE,
SAN FRANCISCO, CAL.
and is not to be removed from the Library Room by any person or under any pretext whatever.

Pl. II

Fig. 1

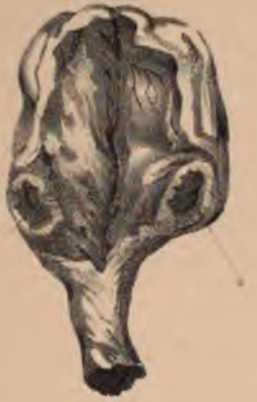


Fig. 2

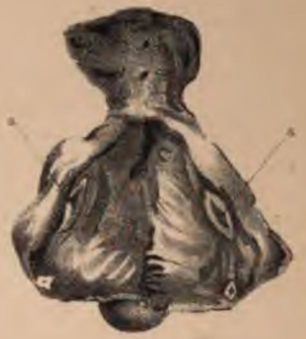


Fig. 4

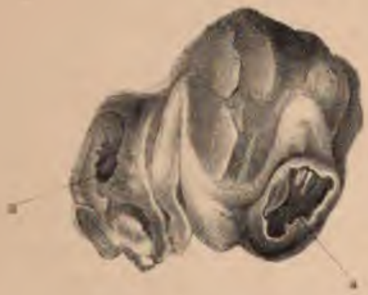


Fig. 3

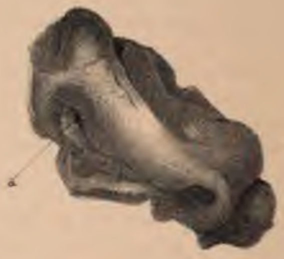


Fig. 5

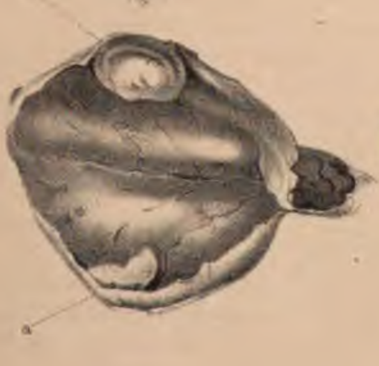
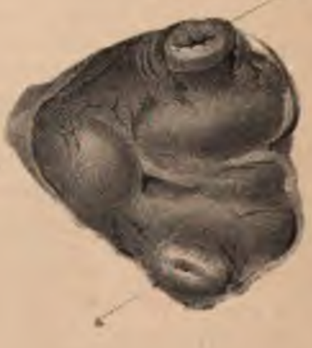


Fig. 6



T. Sinclair's lith Philª

belong to a pregnant female. If the circumvolutions are but feebly united, having between them a layer of plastic matter which serves as a medium of adhesion, the corpus luteum corresponds to the second month of pregnancy; if, on the contrary, the circumvolutions are blended into a compact mass, preserving at the same time a size similar to the preceding, it may be regarded as derived from a woman who had died toward the end of the third month of gestation.

From this time the mass becomes more and more compact, remains stationary for a while, and then tends to decrease until the end of gestation.

We have represented in the same plate, several corpora lutea resulting from menstruation, together with others observed at a more or less advanced period of pregnancy. By comparing the physical differences presented in the two cases, we may readily appreciate the truth of the observations just stated. For Figures 3, 4, 5, and 6, I am indebted to the kindness of my learned master, M. Rayer.

EXPLANATION OF PLATE II.

Fig. 1. *a a.* Corpus luteum four weeks after menstruation.

Fig. 2. Corpus luteum thirty days after menstruation.

Fig. 3. Represents the ovary of a young woman, who, after passing the night with her lover, committed suicide by throwing herself from the third story; death took place twenty-four hours after. *a.* Small rupture produced by the bursting of the vesicle.

Fig. 4. Longitudinal section of the same ovary showing the interior of the vesicle.

Fig. 5. Represents the ovary of a non-primiparous woman, who died in the fifth month of pregnancy, of pneumonia complicated with abortion.

Fig. 6. Ovary of a woman twenty years of age, who died in the ninth month of gestation.

In reviewing the facts whose history we have just traced, we see that towards the age of puberty, the ovary becomes the seat of an active congestion, and, it might be said, of a new vitality; all the living powers of the organ seem to be concentrated upon one of the Graafian vesicles, which suddenly assumes a considerable development, and in so doing, raises the envelope of the ovary, and forms a tumor, which is superadded to the organ. The walls of the vesicle become weaker and weaker as their distention increases, until they finally give way; in consequence of the rupture, the ovule is expelled and carries with it a portion of the granular fluid with which it was surrounded. This expulsion constitutes the phenomenon known of latter time as *spontaneous ovulation.* The void left in the vesicle is soon filled with blood and a gelatinous matter, which is secreted by the walls of the follicle; the latter becomes hypertrophied and thrown into folds by the retraction of the external tunic, and soon constitutes the corpus luteum.

As accessory phenomena, it is known that the uterus and its annexes participate to a greater or less degree in the ovarian activity, and we have briefly described the peculiarities which they present during the accomplishment of the process; we shall have occasion to return to it in future. Our attention should, however, be first directed to the great resemblance between this succession of physiological acts, and the series of phenomena which comparative physiology and anatomy have shown to take place in mammalia at the rutting season. In them likewise, the approach of the male is not necessary to the discharge of the ovule, and the spontaneous ovulation is accompanied with almost identical changes in the genital organs, and manifests its influence upon the entire organism by the same assemblage of phenomena. In the human female, as in the mammalia and birds, the spontaneous ovulation, accompanied with the same cortége of symptoms, occurs at more or less regular intervals. In the rabbit, it is the tumefaction and almost varicose injection of the vessels of the vulva. To this coloring and tumefaction is added, in the bitch, an odorous secretion, which allures the males, and puts them upon the track of the females. Finally, in monkeys, a more or less abundant hemorrhage occurs, which, in the case of the macaquæ and the cynocephalæ, coincides with so monstrous a swelling of the vulva, that, in certain cases, the surrounding parts are infiltrated as though inflamed in consequence of the sting of bees. We shall study hereafter the peculiarities of these returns in the human species.

The vesicular evolution, accompanied with the array of phenomena just described, is reproduced at intervals which vary for different animals, but in the human female recurs at much shorter periods. Every month, in fact, in the normal condition, a new Graafian vesicle is found to increase in size, to become excessively distended, and finally bursting and discharging the ovule, to become the seat of the successive transformations presented by the corpus luteum. Every month, therefore, this curious phenomenon of spontaneous ovulation is renewed; and the dark-colored cicatricules of various form, which are observed upon the surface of the ovary of nubile women, give rise to the supposition exclusive of direct observation, that the operation of which they are the consequence must have recurred a great number of times.

Of the phenomena which we have just described, the flow of blood had, until of late years, chiefly claimed attention. This flow, as well as the vesicular evolution of which it is the consequence, occurs for the first time between the ages of twelve and fifteen years, and is afterward periodically renewed every month until the time of life at which the female loses her aptitude for fecundation, that is to say, until she attains the age of from forty-five to fifty years. Known under the names of the *monthly sickness*, the *monthlies*, *courses*, &c., this periodical excretion constitutes *menstruation*; a phenomenon which, though doubtless of importance, is nevertheless far from being the capital fact amongst those which we have studied, for it may be absent, without the vesicular changes being notably affected thereby, whilst, on the other hand, it never appears without having been preceded and accompanied by the development of a Graafian vesicle. It is therefore a secondary phenomenon intimately connected with those which are accomplished in the ovary. The details into which we are about to enter, in reference to menstruation, will complete the history of the ovarian follicles.

ARTICLE II.

OF MENSTRUATION.

Menstruation is, as we have said, a periodical flow of blood from the genital parts, having its source in the walls of the uterus. Its first appearance, which is always determined by the ovarian evolution of which it is one of the epiphenomena, reveals the aptitude of the female for fecundation, and constitutes one of the earliest signs of puberty or nubility; I say one of the earliest signs, for it very rarely occurs suddenly, and without having been preceded by precursory phenomena.

These phenomena are both local and general. The first, which are purely physical, occur more especially in the generative organs. Thus, the pubic region becomes covered with hair; the pelvis, which hitherto differed but slightly from that of the male, increases in size in every direction, and gradually assumes the shape which we have indicated as peculiar to the well-formed woman; the breasts are rapidly developed, and the nipple is more projecting, turgescent, and sensitive; the skin which surrounds the latter is also of a darker color than before. The outlines of the body at the same time become rounded, in consequence of the greater abundance and more harmonious distribution of the cellulo-fatty tissue.

These physical changes are rarely found unconnected with an alteration in the moral state of the young girl. Her voice assumes a softer tone, her looks are more timid, and often embarrassed in the presence of persons with whom but a few months previously she had sported as a child. She experiences desires, which are the vague expressions of the development of the senses, which she cannot yet understand. A melancholy sadness, and a taste for solitary places congenial to reverie, replace the boisterous pleasures of childhood.

The congestion which precedes the hemorrhage is indicated by new symptoms. The young girl complains of lassitude, of a sensation of swelling and tension in the lower part of the abdomen, of lumbar and sacral pains, of weight in the loins, of heat in the hypogastrium and peritoneum, of a slight itching and tumefaction in the genital parts, and a painful swelling of the breasts. In many cases, the excitement of the genital organs is so great as to produce a violent general reaction; and, according to Boerhaave, the first appearance of the menses is accompanied with fever. Strange nervous disturbances not unfrequently occur, and I have sometimes observed attacks of genuine hysteria. These symptoms may last from one to eight days, and are followed by a more or less abundant flow of mucus; in the course of a few days, this becomes mixed with a little blood, and soon gives place to a flow of almost pure blood. The hemorrhage continues for several days; then, as the amount of blood mingled with the vaginal mucosities diminishes, the flow becomes less colored, and after resuming the characters of the vaginal secretions, ceases entirely.

Quite frequently, the first menstruation takes place without having been preceded by any of these discomforts. Sometimes the eruption of blood occurs whilst playing or dancing, and sometimes during sleep.

In most young girls the eruption returns after the lapse of a month, and follows subsequently its regular periodical course; frequently, however, it is not until after three or four periods, and sometimes even later, that the courses become regular. In other cases, again, a long interval elapses between the two first menstruations: thus, M. Raciborsky, having noticed the time between the two first menstrual periods in eighty-seven females, found that in all but fifty-eight, more than a month elapsed between them. In two women, the second menstruation occurred six weeks after the first; in four, two months; in five, three months; in four, four months; in one, five months; in one, eight months; in three, a year; finally, in one, two years.

These irregularities in the return of the second period may, doubtless, be due to a morbid condition requiring treatment, but they may also depend upon an atony of the genital organs, which does not allow the physiological development of the Graafian vesicles to continue. This temporary atony does not interfere with the general health of the female, nor prevent the future performance of the function; it often disappears under the excitement produced by a change of life, or by the first conjugal approaches. (Raciborsky.)

In some young girls, the functional troubles and abdominal pains, which we have regarded as so many precursory phenomena of the first appearance of the menses, may not be followed by the flow of blood, and, after having lasted for several days, they diminish and cease entirely; they may recur thus every month, for a certain time, with no other result than a momentary disturbance of the general health, and it is only, so to speak, after several fruitless attempts, that the courses become established in a complete and regular manner.

The symptoms which heralded the first menstrual flow do not usually recur at the subsequent periods, or, at least, they continue to diminish with each monthly return. In some females, however, they always appear with their original intensity, and I have often remarked, in reference to these cases, that the acute pains and colics which prelude the flow of blood, disappear, or even cease entirely, immediately after the first conjugal approaches, and especially after the first labor. In a still greater number, the return of the menstrual period is throughout life indicated by some slight pains, a little uneasiness, or merely by a more or less marked disturbance of the general condition; the temper is less even, the woman becomes more excitable, more irascible, in a word, less amiable.

The time at which the first appearance of the menses occurs varies exceedingly from the influence of climate, habits of life, and constitution. The following table, extracted from the work of Müller, with notes by Jourdan, gives an idea of these variations in different countries.

AGE.	Paris, BRIERRE.	Lyons, BOUCHACOURT.	Marseilles, MARC D'ESPINE.	Manchester, ROBERTON.	Göttingen, OSIANDER.	Paris, RACIBORSKY.	Paris, RACIBORSKY.	Norway, FAYE.	Varsovia, LEBRUN.
5 years, . .	1								
7 " . .	1								
8 " . .	2								
9 " . .	11						1		
10 " . .	29	5					7		
11 " . .	96	14	6	10		4	18		
12 " . .	129	26	10	19	3	10	34	4	
13 " . .	138	47	13	53	8	20	40	4	
14 " . .	212	50	9	85	21	29	55	13	1
15 " . .	204	76	16	97	32	38	77	14	15
16 " . .	140	79	8	76	24	41	81	20	27
17 " . .	133	58	4	57	11	20	72	13	35
18 " . .	95	38	2	26	18	20	35	13	13
19 " . .	43	21		23	10	12	26	6	6
20 " . .	33	9		4	8		24	8	2
21 " . .	8	5			1	4	14	3	1
22 " . .	8	1					2		
23 " . .	4				1				
24 " . .		5				2		1	
25 " . .							1	1	
Total, . .	1285	342	68	450	137	200	487	100	100

According to this table, the greater number of first menstruations occur, at Paris, between the ages of fourteen and fifteen years; but it may be remarked, that the most common variations fall between the ages of eleven or twelve, and seventeen or eighteen years.

Warm climates, a residence in cities and the habits which are contracted there, together with robust constitutions, seem to favor the precocious development of puberty; a low temperature, residence in the country, a feeble and delicate constitution, appear, on the other hand, to retard the appearance of the menses.

Numerous exceptions to the averages above indicated are mentioned by authors. Thus, as examples of tardy and precocious menstruation, we see by the table that five women menstruated for the first time at the age of twenty-three years, six at twenty-four, and two at twenty-five. In some very rare instances, the first appearance has been delayed for a much longer time; thus, M. Kleeman mentions the case of a woman who was married at the age of twenty-seven years, and who did not menstruate until two months after her eighth confinement; she then continued regular until the age of fifty-four years. Pecklin speaks of a strong and healthy married woman, who had never menstruated, although she was forty years of age; her courses made their appearance upon one of the first nights succeeding her second marriage, and recurred regularly for two years, at the expiration of which time she became pregnant.

If we compare these cases of tardy menstruation with the numerous instances of women who become mothers without ever having menstruated, and of nurses in whom the suppression of the menses did not prevent conception, we shall find a full confirmation of what was stated in the preceding chapter, in relation to the secondary importance of the menstrual discharge. Regarded as a phenomenon attendant upon the changes going on in the ovary, it may be absent even though the Graafian vesicle should undergo all its phases of development; nor can its absence be now considered as indicative of the impossibility of fecundation.

We cannot accept all the observations of very precocious menstruation; but, laying aside the numerous cases in which the nature of the discharge has not been so well determined as to allow of their reception without questioning, there are some whose genuineness is undoubted, inasmuch as the appearance of the discharge was attended with all the attributes of puberty. Thus, Dr. Susewind knew of a child of seventeen months, which had menstruated since she was a year old; the hemorrhage returned regularly every month, and the breasts and mons veneris were those of a girl of fourteen or fifteen years of age. The child observed by Lenhossek menstruated when nine months old, and at two years she presented all the external signs of puberty. The girl mentioned by D'Outrepont, who had four teeth when two weeks old, was regular from the age of nine months; she had at that time long black hair and prominent breasts. A woman observed by Carus, menstruated when two years old, became pregnant at eight, and died at an advanced age.

In a memoir by M. Dezeimeris, many other similar facts, derived from Schœfer, Louis Robert, Le Beau, Descuret, Comarmond, Clarke, Lobstein, &c., &c., are recorded.

These premature menstruations are certainly due to the same causes which determine their appearance in most women about the age of fifteen years. Being always accompanied by the development of the breasts and the other marks of puberty, they are the evidence, that under the influence of an anomalous vitality of the ovaries, the Graafian vesicles have undergone a very precocious development.

When once well established, the menses assume their regular periodicity, which is generally preserved up to the time of their cessation, without other interruption than that which is occasioned by nursing or pregnancy. They return about every month, as their name indicates; yet the interval between them is far from being the same for every female. The average of the catamenial period is stated by Roser and Wunderlich at twenty-eight days; in a large number, according to Brierre de Boismont, it is thirty days; and in some instances the intermenstrual period is longer than thirty days, extending to five or six weeks, and sometimes even to two months. In some women the returns occur upon the same day of each month; in a much greater number, the end of the solar month is anticipated by two, three, four, or five days. Sometimes the period is much shorter, the returns occurring at an interval of twenty-four, twenty-two, twenty, and even fifteen days.

These frequent variations in the duration and return of the catamenial period are a refutation in advance of the opinion of those authors who think that all women menstruate generally at the same periods, and that there are times in each month when no one is unwell; it is evident that the retardations or the anticipations of which we have spoken, must have the effect of bringing the return of some female upon every day of the year. The flow also commences almost indifferently, during the day or night.

The periodicity of the catamenia generally continues until the age of from forty to fifty years, at which time they usually cease. We shall hereafter treat of the peculiarities which often attend their cessation.

The *duration of the flow* varies between one and eight days; according to Brierre, it most commonly lasts for eight days; and next in order of frequency, we have three, four, two, five, one, six, ten, and seven days. Many observers have noted three or four days, as expressing the most usual duration. In some very exceptional cases, it lasts for a few hours only; in others quite as rare, apart from pathological conditions, it is prolonged through twelve or fifteen days.

The *quantity of blood* lost is variable for the same woman, and especially so when observed in different individuals; we may here add, that it is very difficult in any case to estimate it exactly. If the *two cotyles* of Hippocrates be eighteen ounces (550 grammes), as translated by Galen, his estimate (provided Galen's rendering is correct) is evidently exaggerated, at least for our time and climate. If we appreciate the amount of blood lost by the quantity of stained linen, I think the estimate of Haen, who set it down as averaging from three to five ounces, will be found to come nearest the truth.

The quantity of the discharge appears to be greatly influenced by the diet, habits of life, and climate; it is greater with rich and indolent females who use a succulent diet, than with those who are placed in an opposite condition. According to most authors, very warm climates exert a marked influence upon it, and, for my own part, I am acquainted with several ladies who menstruate much more abundantly in summer than in winter.

It is said that women from the country, who become domestics in Paris, soon find their courses to diminish, and sometimes even cease entirely. Such may be the case with many of them, but it is due chiefly to the influence upon their constitutions of the want of fresh air, exposure to the sun, and of the exercise to which they had been accustomed from childhood, rather than to any change in their diet; for, in general, the nourishment which they receive from their employers is much better than that with which they were obliged to content themselves in their own families.

The amount of the discharge is not the same throughout the duration of the menstrual period; ordinarily, it flows moderately on the first and second days, increases on the third and fourth, and then gradually declines. Neither is the discharge always continuous; it sometimes diminishes and even stops entirely for several hours, sometimes for one or two days, and afterwards reappears either spontaneously or under the influence of a walk or a ride. Moral emotions, sometimes the process of digestion, and, above all, the action of cold, may determine its momentary or final diminution or suppression.

The *seat of the hemorrhage and the nature and qualities* of the menstrual blood, have been the subject of very different opinions. What we have already said, whilst describing the changes in the uterine mucous membrane, during the ovarian evolution, leaves no doubt as to the source of the menstrual fluid. It exudes, manifestly, through microscopic fissures on the internal surface of the mucous membrane of the uterus. This fact, which is placed beyond a doubt by numerous autopsies of women who died during menstruation, had been already proved by the accumulation of blood in the cavity of the womb, where the neck was imperforate, and by the touch, and the speculum, whereby it has been both felt, and seen to flow from the orifice of the uterus.

Certain facts have been adduced in order to prove that, in some cases, the menstrual blood proceeds from the vagina. I think that the greater number of these observations have been either badly made, or wrongly interpreted. I do not deny the possibility of exhalations of blood from the walls of the vagina; but if they present the periodicity of the menses, they can be regarded in no other light than as a misplacement of the latter. The fact related in the note below appears to me to possess great interest in reference to this subject.[1]

---

[1] I have recently (November, 1849) seen, in connection with my excellent confrère, Dr. Thirial, a young girl, twenty-one years of age, who had menstruated only twice and for three days at a time; and in whose case the hemorrhage must of necessity have had its origin in the mucous membrane of the vagina.

This young girl, who had been for a long time violently in love with an officer, finally yielded herself completely to his wishes. After several attempts, renewed with much ardor, but which each time proved fruitless, the young man finally discovered, and acquainted her with the fact, that she was not formed like other women, and advised her to consult a physician. She applied first to M. Thirial, who solicited my opinion. A very careful examination enabled me to ascertain as follows:

The countenance, stature, and development of the limbs and breasts, differed in no respect from what is usual in young girls at her age. Her general health had always been good. In the month of May last, her courses appeared for the first time, and continued three days; she had, however, for several years before, experienced symptoms of uterine congestion. In the month of July, they showed themselves again for the last time. The attempts of her lover were twice followed by a considerable flow of blood, which lasted two days, but she attributed it much rather to the amorous violence to which she had been subjected than to a periodic return of the menses.

The mons veneris is completely destitute of the hair with which it is usually covered. Upon the lateral and inferior regions, immediately above the external orifice of the inguinal canal, a tumor is observed on each side which elevates the integuments. The tumor has the size, form, and consistence of an ovary or testicle; it is but slightly painful; under a very moderate pressure it retreats through the inguinal canal, and disappears in the abdomen, but as soon as the pressure is removed from the internal orifice of the canal, it reappears, sometimes spontaneously, sometimes on the slightest movements, or the least effort of coughing or respiration. On no occasion was I able to perceive the signs which ordinarily accompany the reduction of an intestinal or epiploic hernia.

The vulvar opening was bounded by the greater and the lesser labia, but both were much less developed than usual. The finger, which could be introduced only with difficulty into the vulvar orifice, was arrested at a depth of three-quarters of an inch, so that it was only by forcing up the extremity of the vagina, that the first phalanx could be made to enter that canal.

Upon introducing the extremity of a speculum, it was impossible to discover any opening, or any point which would afford passage to the end of a stylet. I was able to ascertain, at the same time, that the membrane pressed upon by the extremity of the speculum, possessed all the rugæ, and other characters of the vaginal mucous membrane.

As we have already said, the menstrual blood, which is at first small in quantity, becomes mixed with the mucosities which are secreted abundantly by the vagina for a day or two preceding the appearance of the catamenia. The amount of blood soon increases, and the flow becomes almost exclusively sanguineous.

It is very difficult to say whether the blood is furnished by the arteries or veins, or by both together. In all probability, the blood exudes through the walls of the very delicate ramuscules which form the vascular network of the innermost layer of the uterine mucous membrane. The walls of the capillaries are ruptured, and through this solution of continuity the blood escapes. It is not, therefore, a true exhalation.

Now, when gestation has progressed to some extent, these ramuscules become so greatly developed that many of them acquire the calibre of a quill. At this time their true nature may be ascertained, and the fact settled, that they belong to the venous system; so that the menstrual hemorrhage which they supply must evidently have its source, in great part at least, in the reservoir of dark blood.

The physical characters of the menstrual blood vary according to the time at which it is examined, since it is mixed at the beginning, at the middle, and at the end of the flow, with different amounts of vaginal mucus.

The portion which escapes during the second period, not only resembles completely in external characters that which is obtained directly from a vein or an artery, but is shown to be identical by chemical analysis. Its slight coagulability has been regarded as an evidence of a want of fibrine; but, though it coagulates rarely, as a general fact, yet there are occasions in which clots exist in the vagina, and in the cavity of the uterus itself.[1] The presence of fibrine has been chemically demonstrated, so that though the coagulation of the menstrual blood be of rare occurrence, the fact is certainly due to its being uniformly mixed with a considerable amount of vaginal mucus.

On examination by the rectum, I found: 1. That the rectal pouch, or dilatation, was much larger than in the normal condition; 2. That above the extremity of the vagina, when pressed upward by my thumb, the index introduced at the same time by the anus and carried as high as possible, could discover neither fibrous cord nor tumor; nothing, in fact, which could lead to a belief of the existence of the upper part of the vagina and of a uterus; 3. Having introduced a sound into the bladder, the finger in the rectum perceived with the greatest ease that nothing intervened between its palmar surface and the vesical sound, except the normal thickness of the two walls of the rectum and bladder. The sensation was identical with that experienced when the index is introduced into the vagina in order to direct a sound in the urethra.

From this examination I thought myself justified in concluding: 1, that the tumors found in the inguinal regions were the two ovaries; 2, that the lowest extremity only of the vagina was present; 3, that the upper four-fifths of that canal were completely wanting; 4, that, most probably, there was no uterus; 5, that the hypogastric and lumbar pains which were experienced quite regularly, and almost monthly, were the expression of periodical ovarian operations; 6, that the blood of the menses which had appeared twice in this young woman, had its origin in the mucous membrane of the vagina.

[1] It is, however, right to observe, that the presence of clots in the menstrual discharge is frequently due to an alteration of the structure of the uterus, or, at the least, to a functional derangement.

The eruption of the menses is generally attended with a peculiar odor, proceeding at that time from the secretions of the vulva; it increases in intensity during the flow, and has been compared by some persons to the smell of the marigold. Can it be that the strange fears with which menstruating women are regarded in some countries, are attributable to this odor, which in uncleanly individuals is very strong? Although this is probable, I should think it futile to discuss the incredible stories upon which are based the popular notions of the noxious properties of the menstrual emanations.

Certain females discharge by the vulva, at the menstrual period, a kind of membranous bag, which would seem by its form to have been moulded upon the uterine cavity, and which bears a strong resemblance to the membranous pouch (*deciduous membrane*) which is expelled with the ovum in some cases of abortion. The nature of the pouch is, in fact, the same in both cases, being formed of cellular tissue, which is both vascular and glandular; its internal surface is always smooth, provided with epithelium, and often abundantly perforated with glandular orifices. The external surface, by which it adhered to the organ from which it was separated, is shaggy and torn. It is evidently an exfoliated portion of the mucous membrane.

This exfoliation usually occurs in such women only as are afflicted with difficult or very profuse menstruation, accompanied with violent pain (*membranous dysmenorrhœa*), or in such as experience a delay in the appearance of their courses. According to M. Coste, this phenomenon is the result of an excessive congestion, a sort of apoplexy of the mucous membrane; for, says he, coagula are almost always found infiltrated in the substance of the expelled membrane. I would add as probable, that, in some cases at least, this exaggerated congestion may have been the consequence of an abortive conception, or perhaps of solitary venereal excitements.

Those physiologists were mistaken who supposed that at every menstrual period a free secretion took place upon the internal surface of the uterus, and gave rise to a false membrane. Nothing of the kind has ever been proved by anatomical investigation; for the internal surface of the uterus, at whatever moment examined during the catamenial period, always retains the characters peculiar to the mucous membrane, remaining smooth, and covered with epithelium. Sometimes, however, the latter exfoliates, and bears away with it a portion of the substance of the mucous membrane, in which case, the torn glandular tubes rendered free and floating by the separation, form, as it were, a forest of white filaments, and give accidentally to the internal surface of the uterus the villous and shaggy appearance which some authors have erroneously considered as normal. This circumstance is, however, altogether exceptional, and results from the membranous exfoliation of which we have just spoken.

Cause of Menstruation.—Few questions have given rise to more lively discussions than the cause of menstruation; I think it useless, however, to mention here the numerous and more or less whimsical hypotheses which have successively appeared in reference to it. The fact is, that after having read all that has been written on this subject, the mind rests entirely satisfied in its ability to refer this singular phenomenon to one unchangeable and easily verified fact, namely, *the successive evolution of the Graafian vesicles.* We owe this satisfactory explanation to the admirable labors of Négrier, Coste, Pouchet, Raciborsky, Robert Lee, and Bischoff, so that the credit of so beautiful a discovery belongs almost exclusively to France.

That *the cause of the menstrual discharge is the evolution of a Graafian vesicle,* would be an indisputable proposition, provided we are able to show: 1, that the examination of women who died during or shortly after the menstrual period, has uniformly revealed the above-named changes in the ovary; 2, that the absence of ovaries involved of necessity the absence of menstruation; 3, and lastly, that there is a complete analogy between the anatomical and physiological phenomena of the heat of animals, and those which accompany menstruation in the human female.

1. Since attention has been directed to this subject, no one has succeeded in instancing the case of a single woman, who died at the menstrual period, whose ovary did not present a vesicle in a greater or less degree of development, or else one which had been already ruptured. The facts related by Coste, Négrier, Pouchet, Raciborsky, and others, are now so numerous, that it would be impossible to reproduce them in a work like the present. I might myself add, if it were necessary, a considerable number of cases to the others. This universal coincidence affords from the outset a very strong probability of the relation of causality which we wish to establish; but it would become an absolute certainty, were it possible to prove that the absence of the ovaries involved of necessity the absence of the menses.

2. In the case of animals, on which the experiment can be repeated at pleasure, not a doubt is permitted, that the extirpation of the ovaries causes the disappearance, forever, of all symptoms of heat. Analogy alone would lead us, in the absence of positive facts, to suppose that menstruation, also, would cease after castration. But although well-observed instances of the performance of this operation on women are happily very rare, there is yet one which derives a great value in the present discussion from the name of the author. The following is an abridgment of it. A woman, says Percival Pott, had two small tumors, one in each groin, which were so painful as to render working impossible. It was decided to extirpate them. After having divided the skin and the subcutaneous tissues, a membranous sac was exposed, which contained a body resembling an ovary; a ligature was thrown around it, and it was removed. The same operation was performed on the opposite side. The woman recovered; *but the menstruation, which before had occurred with the greatest regularity, never afterwards appeared;* the breasts, which had been voluminous, subsided; she also became thinner, and assumed a more masculine appearance.

From the statement of M. Roberts it would appear that in Central Asia, vestiges are still to be met with of the cruelty of the ancient kings of Lydia, who castrated women, either that they might put them in charge of their seraglios, or in order to gratify their unbridled passions. After arriving at Sérаï, he obtained a nocturnal rendezvous with three persons known as *Padjeras.* The necks of these individuals were not developed, nor had they any nipple; the orifice of the vagina which was entirely obliterated, presented no trace of a cicatrix; their hips were narrow, the pubis entirely destitute of hair, the nates were flattened, &c.; they had no hemorrhoidal flux, no epistaxis nor menstrual discharge, neither had they any sexual desires. They were very muscular, and there was something masculine both in their external appearance and in the character of the voice.

M. Roberts was unable to ascertain precisely the nature of the operation to which they had been subjected in their childhood, for they had no remembrance of it; but if we may judge by the results, which are altogether similar to those produced by castration in animals, it becomes more than probable that the same alterations are due to the same cause.

3. Admitting, finally, the incontestable analogy between the symptoms of heat and menstruation, it will be sufficient to prove, in order to deduce therefrom a favorable argument, that the former is always connected in animals with the ovarian evolution. Now certain experiments do not allow of hesitation. By these it is in fact proved (Coste), that the females never enter into heat except when the preparation for the spontaneous ovulation is going on in the ovaries, that the venereal erethism continues throughout the entire duration of the process of evolution, and that it ceases when the rupture of the capsule has taken place. Finally, it is universally known that castration prevents the females from entering into heat, whilst those which have been deprived of the womb, but not of the ovaries, lose nothing of the ardor with which they receive the male.

Menstruation is, therefore, intimately connected with the evolution of the ovarian vesicles, and cannot occur without it; and every time that it appears, we may feel entirely satisfied as to the existence of the vesicular development. But, as an additional phenomenon, the uterine hemorrhage may be wanting without hindering, in any degree, the regular march of the process going on in the ovary. In a word, the spontaneous ovulation which ordinarily gives rise to an exhalation of blood from the internal surface of the womb, may have its influence restricted to the ovary alone; and to assume the non-appearance of the menses as a ground for denying aptitude for conception, would be incurring the risk of frequent deceptions. Thus it happened that science possesses numerous examples of young girls who became pregnant before they had ever menstruated, as also of women who conceived, notwithstanding a suppression which had lasted for several months.

On the other hand, the regularity of the menstrual function does not necessarily imply the entire fulfilment of the vesicular evolution. In certain cases, the latter process has been seen to remain incomplete, and the vesicle after having attained a certain degree of hypertrophy, to be suddenly arrested in its development, to remain stationary for some time, and then abort without rupture. I have chanced to meet, says M. Coste, cases in which the menstrual flow had passed over entirely, without the ovarian follicle, whose evolution had commenced and even progressed to its final period, having ruptured, or accomplished the result toward which it tended.

The cause of menstruation being ascertained, how shall we account for its monthly periodicity? In other words, why is it that ovulation in the human species recurs about every month? To this question science is unable to reply, for it is probably one of the impenetrable mysteries of nature.

But why should our ignorance upon the subject be a cause of wonder? Do we know why certain trees produce new flowers every month? why this animal is prepared for fecundation every two or three months, whilst that one is so but once a year? The processes which we have studied are intimately connected with fecundation, and are, so to speak, its preludes. Why, when the whole book is unintelligible to us, should we expect to comprehend the preface?

Cessation of the Menses.—As we have before said, the menses continue in the majority of women until about the age of 45 years. According to a table of Brierre de Boismont, 40 years is the age at which the greater number of women cease to be regular. In 60 women observed by M. Pétrequin, it was between 35 and 40 years in ⅛, between 40 and 45 in ¼, between 45 and 50 in ½, and between 50 and 55 in ⅛. In 110 women mentioned by M. Raciborsky, the average age of cessation was 46 years. The latter author cites from Dr. Lebrun of Varsovia, and Faye of Skeen, results which go to prove that in Poland the average term is 47 years, and in the neighborhood of Christiana 48; all which tends to show that in cold climates menstruation terminates later in life. It may be admitted, therefore, that the average duration of the menstrual function is from 25 to 30 years.

But like their commencement, the period at which the menses cease is subject to great variation. Desmoreaux mentions a lady with whom they stopped at 23 years of age; nor is it rare to find them suppressed between 35 and 40. On the other hand, they are often prolonged much beyond the ordinary period, and with them, the women retain the power of conception up to 60, 65, and even, as some authors relate, to 70 years. I leave to the lovers of the marvellous those instances in which menstruation continued until 80, 90, and even 106 years. It is infinitely probable that, in the cases of this nature, the pretended menstrual returns were really due, as Haller remarks, to uterine disease. I would add, that we should place in the same category those examples of women who, after having ceased to menstruate about the age of 45 or 50 years, have had their courses to reappear several years after, and continue with regularity.

According to most authors, those women who menstruate very early also cease to do so sooner than others. This remark appears, both to M. Raciborsky and myself, to be inexact, when not applied to individuals living under different climates. With the former author, we think that precocious menstruation is due to an excess of vital power in the individual, and that, exceptional circumstances excluded, the influence of this vital activity is felt later in life, and prolongs the aptitude for procreation in the woman. So that, in general, it ceases as much later as it begins at an earlier age.

The cessation of the menses, and of the vesicular evolution of which they are an epiphenomenon, produces in the generative apparatus and entire organism of the woman, effects the opposite of those which their first appearance had determined.

The *ovaries* become atrophied, and diminish in size in every direction, and their external envelope becomes folded and wrinkled, so as to present an appearance which, says M. Raciborsky, we can compare to nothing better than the surface of a peach-stone.

The *Graafian vesicles* appear as pouches of a grayish or opaque white color, with wrinkled walls; the fluid which they contained is absorbed; sometimes their cavities are effaced, their thickened walls are in contact, and look like a sort of tubercle, in the centre of which barely a trace of the former cavity is visible. Sometimes no part of the vesicles can be discovered, and the ovary, which has become transformed into a fibro-cellular substance, is so flattened as to be hardly distinguishable at the extremity of its ligament. We have already spoken of the deep folds and wrinkles of its external membrane.

Finally, the womb and the breasts, whose vitality became suddenly so active towards the age of puberty, seem struck with the same blow which destroyed the ovarian orgasm; they waste gradually away, and become, so to speak, foreign to the general life of the body.

This cessation of the ovarian functions rarely takes place suddenly, but is almost always announced several years in advance by more or less marked irregularities or intermissions. Frequently, the returns of the menses suffer postponements, which may be prolonged for several weeks or months, and then, after renewal, be deferred for a still longer period. Sometimes the epochs are marked by a very small discharge, and last for a very short time; again, on the contrary, the quantity of blood lost may be so considerable as to give rise to apprehension. With certain women the flow is so excessively prolonged that the menstrual periods are only indicated by its increase; a mucous flux of a yellowish-white color, which is quite abundant, and either continuous or periodic, replaces the flow of blood in the interval of the epochs, and sometimes remains for a long time after they have ceased. Finally, a general and indefinite feeling of uneasiness, lumbar and pelvic pains, colics, itching at the genital parts, flashes of heat in the face, and sudden and spontaneous alterations of chilliness with profuse perspirations, are added to the local phenomena above indicated.

In the majority of cases, all these troubles are quite slight and disappear promptly; but, in some instances, diseases before latent then declare themselves. It is this fact which, though much rarer than is commonly supposed, has obtained for this time of life the name of the *critical period.* Its dangers have been wonderfully exaggerated, and modern researches prove, in opposition to the opinion of physicians who have preceded us, that the organic affections of the breasts, of the uterus, and of the ovaries, begin much more frequently before than after the cessation of the menses. Finally, it is shown by statistics, that the mortality in women between the ages of 40 and 50 years is not greater than at any other period of life.

CHAPTER V.

OF THE BREASTS.

[THE breasts, two in number, are large glands, annexes, so to speak, of the organs of generation. They are symmetrically placed on the upper and anterior part of the thorax on each side of the sternum, generally occupying the space included between the third and fifth ribs. Rudimentary in man and in the young girl, they become developed in the latter at the period of puberty. They present great individual difference in size, but in the women of certain races they are generally very large, some African nations, for example, having them extremely long.

The left breast is often larger than the right one. Curious anomalies, also, sometimes come under observation. Thus, women are reported having four breasts, and I have myself met with an instance of this kind in a woman who died at the Maternity Hospital. Two breasts of the usual size occupied their normal position, whilst two others, as fully developed, were situated on the upper and lateral parts of the abdomen on the same vertical line with the thoracic ones. At the autopsy, I found abundance of glandular tissue in all four of the breasts, which also contained milk.

A supplementary nipple at a short distance from the principal one, is a more frequent anomaly, of which I have already seen several examples. A wax model from a cast of one of these is now in the collection of the hospital of the "Clinique." In the instances which have come under my observation, the supplementary nipple was well formed, but smaller than the normal one, and milk flowed from it when the gland was pressed. One of the women assured me that the peculiarity was hereditary in her family.

The natural form of the breast is hemispherical, or rather represents a flattened cone with the base upon the chest. The skin covering it presents in its centre a projection known as the nipple. Around the nipple is a colored circle, from an inch and a quarter to rather more than an inch and a half in diameter, called the areola, and is easily distinguished by its contrasted hue. Some further remarks will be necessary to the proper study of all these parts.

The skin covering the breasts is fine and soft, and is provided with piliferous follicles to which are connected large sebaceous glands. The hairs are extremely fine and readily seen only when magnified. Beneath the skin, and between it and the gland proper, is a layer of cellulo-adipose tissue, which increases in thickness in approaching the circumference of the organ. To this fatty layer the breasts owe their regularly rounded form, their softness, and very often the greater part of their size.

The areola is rose-colored in young women, and brown in those who have borne children. The skin covering it is rugous, abundantly furnished with sebaceous glands, and exhibits here and there tuberculous elevations of variable size. These projections, numbering from twelve to twenty, have a somewhat circular arrangement, and are composed of collections of highly developed sebaceous glands which secrete a yellowish-white fluid. The character of the secretion was doubtless the cause of their having been so long regarded as rudimentary nipples giving issue to drops of milk. This erroneous view can no longer be maintained since they are proved to be sebaceous glands.

The areola does not rest upon a fatty cushion like the remainder of the skin of the breast, but is in direct relation with the gland; its lower surface, however, is provided with a layer of smooth muscular fibres disposed around the nipple in close concentric circles, which become more widely separated toward the edge of the areola where they finally disappear. The skin-muscle thus formed compresses the nipple when it contracts. Under its action also, the skin of the areola contracts and wrinkles if the nipple be excited by tickling.

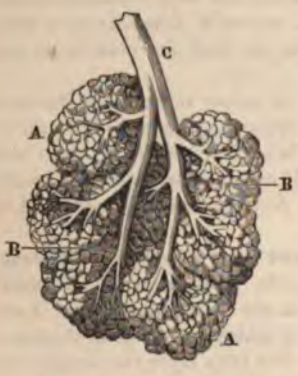
The nipple, situated in the centre of the areola, presents a slightly conical projection, from three to five eighths of an inch in height and from five-sixteenths to three-eighths of an inch in diameter at the base. These dimensions, however, as well as the shape of the nipple, vary greatly. In some women it is very slightly developed and barely projects at all; in others, it is actually below the surface of the areola, presenting a sort of umbilical depression. On the other hand it may be very large or even club-shaped. The skin covering it presents numerous papillæ, separated by creases in the bottom of which are the orifices of great numbers of sebaceous glands. Beneath the skin are connective tissue, elastic tissue, and bundles of muscular fibres.

This structure explains sufficiently why touching the nipple should, by exciting contraction of the fibres which it contains, render it for the moment harder and more projecting. Still, it must not be confounded with the truly erectile organs, inasmuch as its arteries are small and not contorted and the veins also of small size.

The nipple is traversed from base to summit by lactiferous ducts fifteen or twenty in number, which open by as many minute orifices near the free extremity of the organ at the bottom of the folds between the papillæ.

The mammary gland proper, is situated beneath the parts just described, in a fold of the fascia superficialis. It presents a hard, flattened mass which is thicker at the centre than at the circumference. The glandular structure is disposed in fifteen or twenty lobes, separated by a fibrous envelope surrounded by fatty tissue.

FIG. 38.



Lobules of a mammary gland.
A. Acini.
B. Canaliculi.
C. Duct formed by several canaliculi.

Each lobe is formed by the aggregation of a certain number of lobules, themselves composed of glandular culs-de-sac or acini dilated into terminal vesicles. From each vesicle departs a minute duct which joins those of neighboring acini. The ducts from the lobules unite in their turn to form in each lobe a principal canal which has received the name of lactiferous duct.

As each lobe has its principal or lactiferous duct, the whole number of these vessels is the same, *e. g.* fifteen or twenty, as that of the lobes.

The lactiferous ducts all proceed toward the nipple, but in passing under the areola they exhibit dilatations which have received the name of sinuses. Then entering the nipple, they diminish in size and terminate by separate and very minute openings.

It is most probable that the lactiferous ducts are independent of each other throughout their extent. Prof. Dubois, indeed, expressed the opinion that they often anastomose; but M. Sappey, who has investigated the subject more recently, failed to discover any connection between them.

The fact that the walls of these ducts are provided with muscular fibres is sufficient to explain the spirting out of the milk when they contract.

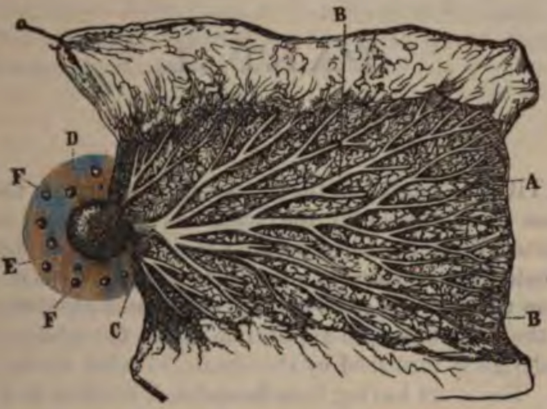
The arteries of the breast come from the external and internal mammary and the intercostal arteries.

The veins follow the same course with the arteries, and empty, some into the internal mammary, and others into the axillary vein.

The lymphatic vessels, which are very abundant, pass into the axillary ganglia.

The nerves come from the intercostal and thoracic branches of the brachial plexus.]

Fig. 39.



A Lobe of the mammary gland.

A. Lobules. B. Canaliculi proceeding from the lobules. C. One of the lactiferous ducts. D. Areola. E. Nipple. F. Sebaceous tubercles of the areola.

PART II.

OF PREGNANCY.

GENERATION is effected in the human species through the medium of two sexes distinguished by the possession of different organs. The sexual characters being therefore peculiar to distinct individuals, the male and the female, these evidently must first approach each other before generation can take place. This first act constitutes *copulation*. The consequence of the approach is an application of the fecundating principle of the male to the germ furnished by the female, in other words, *conception* or *fecundation*. The ovum having been fecundated, remains, and is developed in the organs of the mother during the whole term of *gestation*. Lastly, at the expiration of a nearly uniform period, the new being is expelled, to maintain thenceforth a separate existence; this final act is termed the *accouchement* or *labor*.

Pregnancy is, therefore, the condition of a woman who has conceived, and bears within her womb the product of conception.

This state commences at the instant of fecundation, and terminates with the expulsion of the body which results from that function. It continues for two hundred and seventy days, or nine solar months. This term, however, is not invariable, as it is by no means rare for the pregnancy to terminate sooner, and in some very few instances we find it of longer duration, though some persons have denied this latter fact, and everybody recalls the sharp discussions carried on in France about the middle of the last century, and still more recently in England, on the question of retarded births.

We have already stated that the fecundated ovule traverses the tube, so as to reach the uterus, where it is developed and continues to grow during the whole term of gestation. When the succession takes place in this manner, the pregnancy is said to be a *good*, *normal*, or *uterine* one; but, on the contrary, if the ovule be arrested at some point of its passage, and is developed elsewhere than in the womb, the pregnancy is denominated *bad*, *extraordinary*, or *extra-uterine*. The first, or uterine pregnancy, has been divided into,—the *simple*, where only a single fœtus exists; the *compound*, or double, triple, &c., where there are two or three children; and the *complicated* pregnancy, or that in which the positive existence of a fœtus is coincident with that of a pathological tumor of the abdomen. Again, the term *false pregnancy* has been improperly applied to certain diseases simulating pregnancy, where this state does not really exist.

We shall first treat of simple pregnancy, leaving the subject of twin pregnancies for a special chapter. Extra-uterine pregnancy will be studied with the other diseases of the pregnant female.

The pregnant condition presents two classes of phenomena, one of which pertains to the woman, and the other to the product of conception: they are to be studied separately.

We have already described the genital organs of the female, and it is not our province to notice those of the male. We shall be equally silent upon all that relates to sexual intercourse, though it is our purpose to treat briefly of conception, and in detail of gestation.

CHAPTER I.

OF CONCEPTION.

CONCEPTION takes place during sexual congress; but to understand how it occurs, requires that we should know first what materials are furnished by each individual, how and where these are brought into contact, and lastly, what is not yet, and probably never will be explained, how from this contact a new individual is produced.

1. The spermatic fluid, a glutinous, consistent, and whitish liquid secreted by the testicle, is the fecundating principle furnished by the male. It is heavier than water, and, when shaken with it, forms an emulsion. Its odor is peculiar, and has been justly compared to that emitted by bone filings, or the flower of the chestnut-tree; Wagner states that the odor is due rather to the secretions with which it is mixed than to the sperm itself, the latter, when pure, not appearing to possess any particular smell. By chemical analysis it is shown to contain albumen, salts of phosphoric and chlorohydric acids, and a peculiar animal substance called *spermatine*.

When examined under the microscope, with a magnifying power of three or four hundred diameters, the spermatic fluid exhibits: 1. A great number of little bodies, lying quite close to each other, and which are still moving with more or less activity if the fluid has been taken from a recently-killed animal; these minute bodies have been designated as the *spermatic animalcules*, or the *spermatozoa*. 2. Epithelial cells and minute granules of a fatty nature. 3. These two principal elements of the sperm swim in a small quantity of clear, transparent, and perfectly homogeneous liquid,—the *spermatic liquid*. At the time of the ejaculation, this liquid is mixed with a variable quantity of the fluids secreted by the prostate gland and the glands of Cowper, which latter evidently serve merely to lubricate the parts, to render the sperm more fluid, and, consequently, its expulsion more easy.

The spermatic animalcules attract particular attention by their varied form, their vital properties, and their development. They are met with in all animals capable of reproduction.

In man they are very small, scarcely surpassing the eightieth or the hundredth of a line in diameter. The body is small, oval, somewhat flattened like an almond, and transparent, having a diameter equal to the three or four hundredth part of a millimetre (·001 of an inch). The tail is filiform, thicker at its origin than at any other part, and is large enough to present clearly its double outline; towards the extremity it becomes so fine that it cannot be traced, even by means of the highest magnifying power whence it may be possible that its delicate extremity is still further elongated, and that the spermatozoa may be much longer than they appear.

It is impossible, says Wagner (from whose able works I extract this paragraph), to decide whether the spermatic animalcules have an animal organization, that is, whether they are true animals with an independent life, or not; and all that is either known, or plausibly supposed on this point, may be reduced to a few obscure indications, that are wholly insufficient to establish any positive opinion.

The movements which they exhibit prove nothing, because it is exceedingly difficult to ascertain whether they are voluntary or not. Again, the duration of the movements also varies in the different classes of animals; in the mammalia, they have been observed for twenty-four hours after death.

The spermatozoa do not appear in the human species before puberty; at this period, the testicles receive a large supply of blood, and increase in size; the parietes of the semeniferous tubes become thickened, their capacity increases, and they are filled with granules; then cells containing globules begin to form, and finally the spermatozoa appear in these cells. They are always found in the testicles of men of sixty to seventy years of age, though they are then frequently absent from the vas deferens; the vesiculæ seminales, however, generally contain them even at this time of life.

The germ furnished by the female is evidently existent in the ovary at the marriageable period, and this germ is the ovule. (See p. 90 for its description.)

2. It is unnecessary in our day to prove that an absolute contact of the semen of the male with the ovule of the female is indispensable to fecundation, for innumerable experiments upon living animals, and numerous facts observed in the human species, have long since demonstrated that, whenever any obstacle prevents the approach of these two elements, a conception cannot take place. But at what point does this contact occur? Already had the pre-existence of the ovule in the ovary, the occasional occurrence of ovarian and abdominal pregnancies, and the experiments of Nuck and Haighton, which had rendered fecundation impossible by ligating the Fallopian tubes, tended towards the conclusion that it occurred in the ovary; still this fact was not actually demonstrated, and it needed the definitive proof of finding the spermatozoa on the ovary itself. At present, there cannot be a further doubt on this point, for Bischoff has been fortunate enough to see them there. "I had often seen," says he, "living and moving spermatozoa in the vagina, the womb, and the Fallopian tubes of bitches; but, on the 22d of June, 1838, I had the good fortune to perceive one on the ovary itself of a young bitch in heat for the first time; she was covered on the 21st, at seven o'clock in the evening, and again the following day, at two o'clock P. M., and at the expiration of half an hour, that is, twenty hours after the first copulation, I killed her, and found some living spermatozoa, endowed with very active movements, not only in the vagina, the entire womb and tubes, but even between the fringes of the latter in the peritoneal pouch that surrounds the ovary, and on the surface of this organ itself." Since that period, Wagner and Barry have made the same observations.

Now such results evidently prove that fecundation sometimes takes place in the ovary; but are we hence to conclude, that it is possible in that organ alone? If spontaneous ovulation be now an incontestable fact, may it not be supposed that the ovule, after having left the ovary, can encounter the spermatic fluid and become fecundated, whether it be in the Fallopian tube, or even in the uterine cavity?

[M. Coste's observations seem, however, to prove that fecundation is almost always effected either upon the ovary or in the part of the tube nearest the fimbriated extremity; inasmuch as he maintains that the ovule spoils very quickly when it enters the tube without previous fecundation.]

But the question arises, how does the fluid ejaculated by the male get as far as the ovary? We answer that, in the great majority of cases, it is evident that the sperm having first reached the uterus, upon the neck of which it was thrown by the membrum virile, travels through the tube until it arrives there. This course is certainly due, 1st, to the movements proper of the womb and the tubes; for in the latter, a rapid contraction is observed, following the direction from the vagina towards the ovary, which, of course, is calculated to assist the progression of the sperm; and 2d, to the movements proper of the spermatozoa, which thus of themselves facilitate their own advancement.

3. This first point being once established, the question naturally arises, what was the influence exercised by the sperm upon the ovule of the female during the contact? Now, numerous experiments clearly prove that the sperm owes its fecundating properties to the presence of the spermatic animalcules, and that, whenever it is deprived of these, it immediately becomes unsuited to its proper function. But, unfortunately, it is far more difficult to ascertain the part acted by the spermatozoa, though there have been three hypotheses started in regard to that subject deserving our consideration.

Again, according to certain authors, the fecundating power does not belong to the spermatozoa, but to the seminal liquid interposed between them. In this hypothesis, the animalcules are the *transporters* of this fluid, and the object of their movements is to conduct it to the ovule.

In the opinion of Bory-Saint-Vincent, Valentin, and Bischoff, the spermatozoa are solely destined to maintain the chemical composition of the sperm by their active motions. They suppose that the spermatic fluid is a substance endowed with a chemical sensibility of such a character that, like the blood, it can only preserve the fecundating power while it remains in motion; whence these active elements are inclosed in it whose presence is indispensable—elements, the movements of which are never more active than just at the moment when the semen leaves the place of its secretion, and which appear to exercise the most favorable influence for the maintenance of its composition.

[The oldest view is, that during fecundation the spermatozoids penetrate directly into the ovum. Barry even asserted that there existed in the ova of rabbits an opening for this purpose, and he had once the good fortune to see a spermatozoon enter by means of the fissure.

For a long time this view was thoroughly contested, but has now come into favor again. In 1854, Meissner saw in the ova of a rabbit spermatozoa within the transparent zone and in immediate contact with the yolk. The observation was verified by Wagner, Heale, and several others; and M. Coste, whilst examining the ova of salmon and trout, discovered in the vitelline membrane a well-defined microscopic opening provided with an internal valve. In other ova, M. Robin saw spermatozoa inside of the vitelline membrane without being able to discover the opening through which they had passed.

Similar observations have become so numerous, that the passage of more or less spermatozoa into the ovum itself is regarded as an established fact. Once within the ovum, they undergo a retrograde metamorphosis, and are resolved into granulations which mingle with the elements of the vitellus or yolk.]

This is a summary of the most recent opinions. Whichever one may be adopted, the mind remains unsatisfied; for it must be acknowledged there is still a mystery that all the most ingenious hypotheses have failed to solve, and which will probably escape all our researches.

When fecundation takes place, the Fallopian tubes, which participate in the stage of turgescence of all the other genital organs, retain their free extremities in contact with the ovary, and the ovule, having escaped from the vesicle, immediately engages in their canal; being pressed onwards by the peristaltic contractions of the tube, it advances step by step through this duct, and finally arrives in the uterine cavity, where its development unceasingly progresses until the regular term of pregnancy. (See the chapter on *Ovology.*)

Nearly the same phenomena take place, when the contact of the fecundating fluid with the ovule is deferred until after the latter has passed into the tube.

It is extremely difficult, not to say impossible, to ascertain the exact period at which the fecundated ovule reaches the cavity of the womb. In animals, we may note without difficulty the time of fecundation; but this, of course, is generally impossible in the human species, and this obstacle renders nearly all our observations uncertain and incomplete. Further, very numerous researches have clearly proved that the ovule in mammalia does not always arrive at the same moment in the womb, and it is exceedingly probable that the same variations exist in the human female.

In the present records of our science, there is no one conclusive fact that proves the ovule to have ever been seen in the womb of a woman prior to the tenth or twelfth day after her conception.

Baër examined a woman, who committed suicide eight days after conception; the deciduous membrane had commenced forming, but he could not detect any trace of the ovule in the uterus. (*British and Foreign New Review*, January, 1836, p. 328). The same occurred in the cases cited by Weber (*Disquisitio anatomica uteri et ovariorum puellæ, septimo a conceptione die defunctæ instituta*). Dr. Pockels speaks, it is true, of an ovum of eight days, found in the uterus, and in which *the fœtus could easily be distinguished;* but the description furnished by him evidently applies to an older product. (Allen Thompson, in the *Edinburgh Med. and Surg. Journal*, vol. lii. p. 122.) Ovules of eleven days were the youngest observed by M. Velpeau.

After the exit of the ovule, the Graafian vesicle soon retracts upon itself, and thus contributes to the formation of the corpus luteum before spoken of (p. 96).

We shall hereafter describe the modifications which the ovule undergoes during its passage through the tube, and after its arrival in the uterus.

Conception is an act that takes place unconsciously, and altogether involuntarily; although some females, more especially those who have had children, imagine that they can distinguish a prolific connection from others. They say a much more voluptuous sensation is then experienced, a spasm much better marked; and I have met with too many females who acknowledged having made this observation, not to believe there is some truth in the assertion.

The same ignorance that prevails as to the causes of fecundation, likewise exists with regard to those opposing its accomplishment. For, though vices of conformation or faulty position of the uterus, as also obliterations of the neck or tubes, may explain the sterility of some individuals, it is wholly impossible to understand why some women are barren, although well formed—why, in a considerable number of cases, married females have not had children during their first marriage, whereas they subsequently became pregnant, when even it has been observed that the first husband had children by a former bed.

The period at which fecundation is most likely to take place, appears to be that immediately following the flow of the menses; thus M. Raciborsky has ascertained that the conception took place a little before or after their appearance, in fifteen females, who could designate precisely the time of the sexual approach. It is indeed evident, that everything seems admirably prepared at this period for the reproduction of the species; but I am far from concluding, as M. Raciborsky has done, that the aptitude for fecundation in the human race is limited to a few days, either preceding or following the menstrual terms. Experience has convinced me that sexual intercourse may be fruitful, even when it takes place in the middle of the interval between the two menstrual epochs. In this case it is probable that the excitation produced by coition may be communicated to the ovarian vesicles, and cause modifications in them altogether similar to those experienced in the menstrual evolution; the fact itself appears to me to be settled beyond a doubt.[1]

---

[1] M. Coste, who also admits the possibility of conception without regard to the period at which copulation takes place, is prepared, he says, to demonstrate by undeniable proofs, that the ovum detached from the ovary during, or towards the close of menstruation, loses all capacity for fecundation within a very few days after being set free. Conception is, therefore, only possible at other times than near or during the menstrual epochs, when other circumstances happen to produce in the ovary an operation similar to that which takes place at the period of heat. Now is this possible? Comparative physiology replies in the affirmative, by demonstrating it to be so as regards certain animals, thus rendering it at least very probable for the human species also.

In animals living in the savage state, says the learned professor of the College of France, the ovaries accomplish their functions only at rare intervals; but when domesticated, the maturation of the eggs may become so frequent in certain species, I shall not undertake to refute the opinion of those who believe that either sex can be created at will; yet I think it not improbable that the physical constitution of the husband or of the wife may have some influence in determining the sex of the child. The admirable observations of M. Girou seem to me to have proved that with the inferior animals, at least, the stronger the male is in comparison with the female, the greater is the chance of producing a male, and *vice versa.* The observations I have been able to make on the human family since reading the statistical results of M. Girou, have generally confirmed their conclusions.

Here terminates what I had proposed to say in reference to fecundation. It will be seen that I have limited it to a very brief exposition of the most generally received views of this point of physiology. The size, and especially the object of the work, seem necessarily to exclude more ample details.

---

that the ovulation occurs almost daily. Thus the wild pigeon, which deposits her eggs but once or twice a year, sets seven or eight times, when she takes up her abode in our dove-cotes. Under the influence of an appropriate nourishment, our domestic fowls lay almost every day for eight months in the year. The rabbit of the fields brings forth but once or twice yearly, whilst living at large; but in the domestic condition, she will reproduce as often as seven times, if care be taken to wean the young at the proper moment.

There are therefore conditions of shelter, of temperature, and of alimentation, which, by acting on the organism of animals, may cause their ovaries to exercise their functions more frequently in a given space of time. To this it may be added, that in mammalia, the cohabitation of the males is one of the most active accelerating causes of the dehiscence of the vesicles. Thus, for example, a female rabbit when placed alone in a cage where she is completely protected from the attempts of the male, enters ordinarily into heat about every two months, and when the time of this periodic excitement is past, she refuses obstinately to submit to coition; but if, instead of separating her from the male, whom she then repels with violence, he be allowed to remain with her for a few days only, it may be regarded as certain that she will not resist long, because the solicitations to which she will be incessantly subjected will provoke the return of a condition which, in the absence of this excitement, would have been much longer in appearing.

There are, therefore, natural and entirely spontaneous periods for the maturation and discharge of ova, and there are also others which may be styled artificial, because it is possible to produce them through the means of external agents.

Now, is it possible to suppose that the human female, who commands all these conditions at her will, is, by an inexplicable exception, inclosed within the impassable boundaries of her menstrual periods? And if, in spite of her first vigorous resistance to the attempts of the male, the rabbit finally yields to the influence of his companionship, why in woman, who of all the females of the mammalia is endued with the most constant readiness for coition, should not the sexual allurements have the same result?

This accidental evolution of a vesicle is not followed by the menstrual flow which ordinarily accompanies it; all which is very comprehensible, for we must not forget that the same cause which provokes the discharge of the ovule, is also that which fecundates it, and that in doing so, it arrests the tendency to hemorrhage before it has time to appear. (Coste, *Histoire générale et particulière du developpement des corps organisés.*) The same thing, in fact, happens when fecundation occurs a few days or hours only before the appearance of the menses.

CHAPTER II.

CHANGES IN THE MATERNAL ORGANISM DURING PREGNANCY.

A DEEP impression is produced upon the maternal organism by the pregnant condition, giving rise to important anatomical and functional alterations.

ARTICLE I.

ANATOMICAL CHANGES IN THE UTERUS.

The uterus undergoes remarkable changes, and we shall commence our description with them.

These modifications may either be in the volume, form, situation, direction, and relations of the womb; hence, on account of their great importance, we shall successively study them in the body and in the neck; then we will point out the changes which the structure of the organ undergoes.

§ 1. CHANGES IN THE BODY OF THE UTERUS.

A. *Volume.*—We have already learned that under the influence of the hemorrhagic congestion which the uterus undergoes at each menstrual period, the bulk of the organ is increased. If conception takes place within a few days preceding or following the flow of the blood, the excitement produced by the fruitful coition maintains, and soon increases the hypertrophy of its walls. Thus, we shall find further on (see *Decidua*), that the mucous membrane especially becomes almost doubled in thickness, so that when the fecundated ovule arrives in the cavity of the womb, it finds it entirely filled with the membrane, which is swollen to such an extent as to be thrown into folds from want of room to develop itself. (See page 95.)

The same thing precisely occurs in those exceptional cases in which fecundation takes place some time from the menstrual period. Here the hypertrophy also begins under the influence of the evolution of a Graafian vesicle; only the evolution, instead of being spontaneous, is the result of a more or less prolonged venereal excitement.

As soon as the ovule arrives in the womb, the latter begins to develop, and its volume continues to increase until the end of pregnancy; but this progression is not uniform, for, according to the observations of Desormeaux, it is much slower in the early months, and more rapid in the latter. An accurate idea of this increase may be formed from the following table, which represents the usual dimensions of the uterus at the principal periods of pregnancy.

	VERTICAL DIAMETER.	TRANSVERSE.	ANTERO-POSTERIOR.
Third month, . . .	2¾ inches.	2¾ inches.	2¾ inches.
Fourth " . . .	3¾ "	3¾ "	3¾ "
Sixth " . . .	8¾ "	6¼ "	6¼ "
Ninth " . . .	12½ to 14½ "	9½ "	8¾ to 9¼ "

The development of the uterine walls is not purely mechanical, as has been supposed, nor is their distention the result of the development of the ovum, which, by pressing upon the different points of the internal surface, would tend to separate them more and more.

If we consider the small volume of the ovule in the first weeks of pregnancy, as compared with the thickness of the walls of the uterus at the same period, we shall not fail to be convinced that the expansive force of the ovum would be unable to overcome their resistance. The development of the ovum and that of the uterus are simultaneous, but effected by forces which are inherent in each; in a word, the growth of the ovum acts as a physiological cause, but not as a mechanical agent in the development of the walls of the uterus.

B. *Shape.*—The shape of the uterus changes simultaneously with the alteration in its volume. Being flattened, at first, on its two faces, the womb grows rounder and soon becomes pyriform, then spheroidal, and towards the end of pregnancy it has the form of an ovoid, which is slightly flattened from before backwards. The anterior face, however, is much the more convex, and the posterior one is depressed, so as to accommodate itself to the prominence of the lumbar vertebræ.

At the end of pregnancy, the superior extremity of the uterine ovoid is quite regularly rounded; that side of the fundus, however, which is occupied by one of the extremities of the fœtal ovoid, being often more elevated than the other, which is filled with fluid only. Now, as in the most usual presentations, the trunk of the fœtus is generally inclined towards the right, the right side of the fundus of the uterus is commonly the most elevated. (Hergott.) Sometimes both sides are alike in this respect, and there is a depression upon the middle and upper part of the organ.

Such is the shape of the uterus in the majority of cases; but the situation and number of the fœtuses, and the structure and primitive form of the organ, may produce important changes in the shape which it assumes during gestation; and which will claim our attention hereafter.

C. *Situation.*—It is evident that the uterus cannot thus change in shape and size, without undergoing a simultaneous alteration in its position; for example, during the first three months of gestation, the womb remains sunken in the excavation, but as the volume increases in all directions, the fundus of the organ rises towards the superior strait, whilst its inferior part and neck subside still more towards the floor of the pelvis. This depression of the organ is produced by its yielding to the laws of gravitation from its own increased weight, as also by the augmented pressure of the intestinal mass upon the larger surface, created by the change in the fundus. Hence, both its increase of volume and its weight, augmented by the pressure of the intestinal mass, which now has an extensive *point d'appui* on the fundus, contribute to produce the first change in position.

At the same time, the uterus remains in the sacral cavity from the greater space found there, and, the fundus being turned a little backwards, causes the neck to advance slightly. Besides, the presence of the rectum on the left most generally obliges the organ to deviate towards the right, and the neck, in a corresponding manner, to the left; consequently, during the first three months, the cervix is directed downwards, forwards, and a little to the left.

About the third month and a half, or the fourth month, the uterus, no longer finding sufficient room in the excavation for its continued development, rises above the superior strait, then to the level of the umbilicus, and reaches the epigastric region towards the end of pregnancy.

In tracing out the gradual elevation of the fundus uteri, it will be found, at the fourth month, to rise two or three fingers' breadth above the pubis; at five months, it is within one finger's breadth of the umbilicus; and from the fifth to the sixth month, it approaches and passes the umbilical depression, so that at six months it is half an inch above this ring; three fingers' breadth at seven months; and four to five at eight months; it still continues ascending in the commencement of the ninth, but in the last fortnight of gestation, the womb seems to sink down, being, in fact, on a lower level than before. This last is a remarkable occurrence, though it has been said in explanation that the uterus, as if overburdened with the weight of the fœtus during the latter period, collapses to some extent, and enlarges in the transverse and the antero-posterior diameters. This may be true as regards some females who have previously had children, for not unfrequently they say to us at this time, "It has all gone to the sides;" but I believe a more general explanation of the fact may be given; for, in the great majority of cases, if females be "touched" near the end of pregnancy, a voluminous tumor, covered by the inferior and more especially by the anterior part of the uterine body, will be readily felt occupying the excavation. This is the head of the fœtus, which has descended in consequence of its own weight, carrying the wall of the uterus before it, and become engaged in the excavation, sometimes even as low down as the floor of the pelvis.

Now, does not this circumstance, which may be remarked whenever the head presents regularly, and when there is no malformation of the pelvis, furnish us a sufficient reason for the depression of the entire uterus? How, in fact, could the superior do other than follow the inferior part of the organ?

D. *Direction.*—In passing up into the abdominal cavity, the uterus is obliged to follow the direction of the axis of the superior strait, and being thrown off by the lumbar column, and finding much less resistance from the anterior abdominal wall, it necessarily inclines forward; but, owing to the lumbar projection, it cannot possibly remain on the median line, and hence it leans towards one side of the abdomen, the right one, remarkable as it may seem, at least eight times in ten.

Most authors, since the days of Levret, have endeavored to explain this great frequency of the right lateral obliquity. Levret himself taught, that the uterus always inclines towards the side where the placenta is inserted; for this point, he said, being the thickest and most vascular part of the whole organ, is also the heaviest, and this increased weight augmented by that of the placenta, must necessarily draw the organ to that side; but experience has shown that the placenta is far from being always inserted on the one side towards which the uterus is inclined. Again, according to Desormeaux, the presence of the iliac portion of the colon, which is usually filled with fecal matter, prevents the womb from leaning to the left, when it commences ascending out of the excavation, and thrusts into the right iliac fossa, whilst the mass of the small intestines is pushed to the left side by the ascent of the womb (where the direction of the mesentery *would naturally* draw them), and this assists both to maintain and to increase the inclination of the uterus to the right. But, as M. Paul Dubois has justly remarked, any influence which the colon, placed on the left, may have, is fully compensated by the presence of the cœcum on the right; and, from the observation of M. Velpeau, the mesentery is directed from left to right, and not from right to left as Desormeaux has it, doubtless by mistake.

The habit of using the right arm, and of lying upon the right side, has also been brought forward in explanation of this right lateral obliquity, but subsequent observation has not sustained the assertion; thus, for instance, in seventy-six females, all of whom had the uterus inclined to the right, thirty-eight rested on the right side, twenty on the left, fourteen alternately on both sides, and four on the back. And we may further remark that, down to the present time, it has not been observed that the uterus is placed upon the left side of the abdomen more frequently in those women who habitually use the left arm than in others.

Madame Boivin has given an entirely different explanation of this fact; she asserts that the round ligament of the right side is shorter, stronger, and contains more muscular fibres than that of the left, and she attributes the right inclination of the organ to the more powerful action of this ligament.

Professor Cruveilhier thinks that the shortness of the round ligament on the right, is the effect and not the cause of the uterine obliquity; "for I have frequently had occasion," he remarks, "to observe that the shortening which occurred on the left, in left lateral obliquity, was constantly accompanied by a remarkable increase of volume." I must confess that I do not comprehend upon what M. Cruveilhier founds this opinion.

[In order to test Madame Boivin's explanation, M. Pajot, in connection with Dr. Rambaud, former prosector to the hospitals, undertook new measurements of the length of the two round ligaments.

From their investigations it would appear, that even in women who have been delivered, the left round ligament is not so often the longer as has been supposed, and more especially is this greater length far less common than the right lateral inclination of the womb during pregnancy.

All the explanations of the fact being then so unsatisfactory, M. Pajot comes to the conclusion that the inclination of the pregnant uterus is due to the mode of evolution of the organ itself.

Beside this lateral inclination, the entire womb undergoes a rotation upon its axis, which carries its anterior surface a little to the right, whilst the posterior surface looks backward and to the left.

From this it results, that, if during an autopsy the abdominal parietes be removed without disturbing the womb, the annexes of the uterus and the ovary of the left side are found in front, whilst the same parts belonging to the right side are concealed behind near the right sacro-iliac symphysis.]

E. *Relations.*—At term, the uterus is in relation—1. In front, with the vagina, the posterior face of the neck and body of the bladder, and superiorly, with the anterior abdominal wall. This last is not always three months, the cervix is directed downwards, forwards, and a little to the left.

About the third month and a half, or the fourth month, the uterus, no longer finding sufficient room in the excavation for its continued development, rises above the superior strait, then to the level of the umbilicus, and reaches the epigastric region towards the end of pregnancy.

In tracing out the gradual elevation of the fundus uteri, it will be found, at the fourth month, to rise two or three fingers' breadth above the pubis; at five months, it is within one finger's breadth of the umbilicus; and from the fifth to the sixth month, it approaches and passes the umbilical depression, so that at six months it is half an inch above this ring; three fingers' breadth at seven months; and four to five at eight months; it still continues ascending in the commencement of the ninth, but in the last fortnight of gestation, the womb seems to sink down, being, in fact, on a lower level than before. This last is a remarkable occurrence, though it has been said in explanation that the uterus, as if overburdened with the weight of the fœtus during the latter period, collapses to some extent, and enlarges in the transverse and the antero-posterior diameters. This may be true as regards some females who have previously had children, for not unfrequently they say to us at this time, "It has all gone to the sides;" but I believe a more general explanation of the fact may be given; for, in the great majority of cases, if females be "touched" near the end of pregnancy, a voluminous tumor, covered by the inferior and more especially by the anterior part of the uterine body, will be readily felt occupying the excavation. This is the head of the fœtus, which has descended in consequence of its own weight, carrying the wall of the uterus before it, and become engaged in the excavation, sometimes even as low down as the floor of the pelvis.

Now, does not this circumstance, which may be remarked whenever the head presents regularly, and when there is no malformation of the pelvis, furnish us a sufficient reason for the depression of the entire uterus? How, in fact, could the superior do other than follow the inferior part of the organ?

D. *Direction.*—In passing up into the abdominal cavity, the uterus is obliged to follow the direction of the axis of the superior strait, and being thrown off by the lumbar column, and finding much less resistance from the anterior abdominal wall, it necessarily inclines forward; but, owing to the lumbar projection, it cannot possibly remain on the median line, and hence it leans towards one side of the abdomen, the right one, remarkable as it may seem, at least eight times in ten.

Most authors, since the days of Levret, have endeavored to explain this great frequency of the right lateral obliquity. Levret himself taught, that the uterus always inclines towards the side where the placenta is inserted; for this point, he said, being the thickest and most vascular part of the whole organ, is also the heaviest, and this increased weight augmented by that of the placenta, must necessarily draw the organ to that side; but experience has shown that the placenta is far from being always inserted on the one side towards which the uterus is inclined. Again, according to Desormeaux, the presence of the iliac portion of the colon, which is usually filled with fecal matter, prevents the womb from leaning to the left, when cases the hand appearing to be separated from them by a layer of but a few lines in thickness. Notwithstanding all this, it is nevertheless true that the entire bulk of the uterine walls undergoes considerable increase during gestation in consequence of the great extension in surface.

To prove this, it is only necessary to weigh the uterus of a woman dead at the end of her pregnancy, when it will be found that the weight of the organ, after separation from the neighboring parts and removal of its contents, will vary from three to almost four pounds. In the case of M. Moreau, above cited, it was nearly four pounds.

The uterus, therefore, increases at least twenty times in weight during pregnancy, a fact surely sufficient to prove the occurrence of hypertrophy under these conditions.]

Again, the thinness may be partial; thus Hunter describes a uterus, the posterior walls of which exhibited this phenomenon in a remarkable degree.

G. *Density of the Walls.*—The uterine parietes, in the non-gravid state, are very hard and resisting, and have nearly the consistence of fibrous tissue, but during pregnancy this density diminishes and the walls become soft and flabby. The ramollissement begins to show itself as early as the first month, and constitutes at that period one of the best signs for proving a commencing pregnancy (see article on *Diagnosis*), because, instead of presenting the fibrous density of the ordinary state, the walls have a clammy softness closely resembling that of caoutchouc softened by ebullition, or that of an œdematous limb. This decrease in the consistence of the uterine walls constantly advances, so that, at a later period, a light pressure made on the anterior abdominal parietes will easily depress or deform them; consequently, the extremities and other inequalities of the fœtus may be detected, and its movements may even cause an elevation of some part or other; the child, therefore, is not placed in a cavity having immovable walls.

The diameters of this cavity will vary with the position taken by the fœtus, which can, in some cases, continue to change them until the end of gestation, the flexibility of the walls permitting its long diameter to pass through the small ones of the organ; and we can readily comprehend how this flexibility, this suppleness of the fibres of the womb, will aid in preventing the disastrous consequences which otherwise might result to the child from any violent blows on the abdomen, or from the shocks experienced by the mother.

§ 2. Modifications in the Neck of the Uterus.

The modifications which the neck undergoes during pregnancy, are referable: 1, to the consistence of its tissue; 2, its volume; 3, its form; 4, its situation and direction.

1. As the softening of the tissue of the neck of the uterus seems to be an all-important fact, we therefore give it the first place.

Now, everybody knows, that, in the non-gravid state, the uterine tissue resembles the fibrous in its consistence; but immediately after conception, and from the sole fact of the active congestion which the genital organs then experience, this consistence begins to diminish, although, from being coincident with the hypertrophy of the uterine walls, it is scarcely sensible during the first few days, whatever may be the extent of the neck examined. But towards the end of the first month we may ascertain that, independently of this original general modification, the most inferior, or rather, the most superficial part of the lips of the os tincæ, begins to soften. It resembles more a swelling of the mucous membrane than a true "ramollissement" of the proper tissue of the lips; so that by pressing slightly on this thickened membrane the finger first detects a fungous softness, but soon reaches the proper tissue of the neck, which still maintains its normal consistence. The sensation then experienced by the finger greatly resembles that communicated when it is pressed on a table covered by a soft and thick cloth, or, better still, a sheet of India-rubber; and it is only towards the end of the third, or beginning of the fourth month, that the lips of the os tincæ are softened throughout their whole thickness to the extent of a line or a line and a half.

At the commencement of the fifth, the softening increases from below upwards, and at the sixth embraces the moiety of the sub-vaginal portion. During the last three months it invades the superior part by degrees, and last of all the ring of the internal orifice, so that, at the end of gestation, the neck is so soft in certain females, that I have frequently seen students have great difficulty in distinguishing it from the walls of the vagina.

This modification of the neck, which authors have scarcely spoken of, is one of the most important signs; because, after a little experience, it affords us one of the best means for ascertaining the different stages of pregnancy; being constant, and found in all females, unless the neck should be the seat of some pathological alteration. It is worthy of notice, however, that the softening is not so well marked, and is much slower in its progress in primiparæ, than in women who have previously had children; but in all, it steadily proceeds from below upwards.

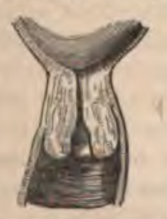
As before remarked, we may judge very nearly of the probable period of pregnancy by the extent of softening, as it progresses from the inferior to the superior part of the neck; though there is one important remark to be made on this subject, namely, that whenever females have had a great number of children, the sub-vaginal portion of the neck loses the greater part of its length; the extremity then projecting into the vagina, and capable of exploration by the finger, being much shorter. Now, as the softening of the supra-vaginal portion of the neck is of much more difficult detection, it may be thought to be much less extensive than it is in reality, whence we may expect to find a great difference in the extent of the softened part, if a comparsion be made between the necks in two females, both advanced to the sixth month, one of whom is pregnant for the second time, and the other had previously borne ten children. Wherefore it is necessary, in making this appreciation, to bear in mind the number of former pregnancies, as also the real length of the sub-vaginal portion of the cervix.

2. *Volume.*—Some singular ideas on this subject have been promulgated by many authors, but the following appears to be the most constant rule: the neck doubtless participates in the hypertrophy of the uterine walls during the earlier months, though its development is far less considerable. The neck becomes thicker and grows more voluminous, especially at the

superior part, but I have never observed its elongation to the extent of two inches, as Madame Boivin apparently believes, or to two and three-quarters and three inches, as M. Filugelli has more recently advanced; for, as elsewhere observed, these opinions result, in my estimation, from an error. The neck, in the commencement, being much lower, and directed more in front than in the ordinary condition, the finger can easily explore a larger extent of it, and thus an impression is created of an increase in its length which really does not exist; for frequent post-mortem examinations of females who died in the early months of pregnancy, have convinced me that, even if the neck is increased in thickness, its length does not undergo any appreciable augmentation.

At the commencement of the fifth month, according to most writers, the cervix begins to diminish. In the sixth month (they say) it begins to spread out at the superior part, so as to aid in the enlargement of the body of the womb, and this spreading at the upper part continues to advance in proportion as the term of gestation approaches, and consequently the length of the neck decreases from above downwards, so as merely to present at last, at the close of the ninth month, a ring of variable thickness. In fact, the diagnosis of the different periods was based on this gradual shortening, and, agreeably to the majority of the French accoucheurs who have adopted the opinions of Desormeaux, the neck has lost at the fifth month about one-third of its length, one-half at the sixth, two-thirds or three-quarters in the seventh, three-fourths or four-fifths in the eighth, and the remainder is effaced during the course of the ninth month; and yet, I do not hesitate to pronounce all this an entire error, which was first pointed out by M. Stoltz, in 1826, and to which I also have constantly asked attention since the year 1839. No; the neck does not shorten in the way which has so long been described; it preserves its whole length until the last fortnight of pregnancy; and it is an easy matter, especially in women who have previously borne children, to verify this remark, as we shall presently demonstrate. But during the last few weeks, its length, which until that time was intact, diminishes very rapidly, and even disappears by a total effacement; and we shall in due season explain the simple mechanism of this phenomenon.

But to return; I have frequently been enabled to prove, in primiparæ, the truth of M. Stoltz's assertions; for in these women the neck does diminish a little in length, during the last three months, although by a process entirely different from that described by Desormeaux. Thus, towards the seventh month, the ramollissement has invaded the whole intra-vaginal portion; the parietes of the neck, having lost their consistence, are easily separated by the liquids secreted upon their internal face, and the upper part of this portion being turned outwards, enlarges in such a manner as to cause the whole neck to resemble a spindle in its shape; the superior extremity of which is formed by the internal orifice (still closed), and the inferior is constituted by the external one, which is scarcely opened in primiparæ, even at the end of gestation, as we shall hereafter show.



A section, showing the neck of the uterus; the anterior and posterior lips are seen *in situ*, being separated from each other by the fusiform cavity of the neck.

Now, it is easily understood how this bulging of the middle part of the neck can only take place just in proportion as the two extremities of the latter approach each other; thus, of course, detracting so much from its total length. I do not believe, however, with M. Stoltz, that the approximation of the two orifices can be so great as to cause a material shortening of the neck, though this certainly does exist to some extent. The shortening of the neck is therefore real, though slight, in primiparæ; being accomplished, however, by a different mechanism from that taught by most authors. Its upper part does not spread out so as to contribute to the enlargement of the cavity of the body, but suffers a sort of collapse, which brings the two orifices nearer together, at the same time increasing its central cavity, and extending its transverse diameters at the expense of the vertical. What has been said concerning the rapid effacement of the neck during the last few days in multiparæ, equally applies to primiparæ; the process taking place by the same mechanism.

3. *Form.*—The principal modifications in the shape of the neck have already been presented, but they ought to be studied in a more special manner, according to whether they are found in primiparæ, or in women who have previously been mothers.

A. At the commencement, in primiparæ, the cervix appears more contracted and more pointed, resulting, perhaps, from the augmentation of its superior part in volume; the orifice of the os tincæ, which, before conception, presented a simple linear and transverse fissure, now assumes a circular form, constituting, as it were, a small lenticular fossa. A little later, as mentioned above, the middle part of the cavity of the neck enlarges, so as to give to the whole cervix the form of a somewhat elongated spindle, rather than that of a cone, which it previously had. It continues smooth and polished on the exterior surface, and the periphery of its orifice is rounded, without any irregularities or fissures; sometimes presenting a soft circumference, at others a thin and sharp border: the latter rarely happens, however, before a very advanced stage. At this time, it is very easy to ascertain what changes the neck has undergone, for although the external orifice is constricted, it is very much softened, and sometimes allows the finger to pass with a very slight effort and enter the cavity of the neck. The base of the last phalanx is then felt to be grasped quite tightly by the external orifice, whilst the extremity of the finger is at full liberty in the fusiform cavity of the neck. It may also be readily observed that the two orifices are still widely separated, for the entire length of the first phalanx and sometimes more, are capable of being contained in the cavity.

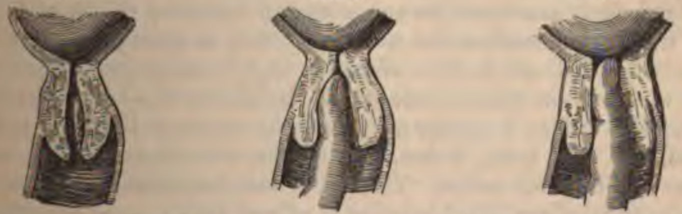
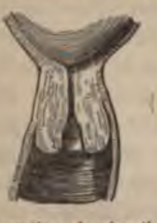


FIG. 40. FIG. 41. FIG. 42.

These three figures give an idea of the gradual dilatation which the cavity of the neck undergoes at various periods of pregnancy.

superior part, but I have never observed its elongation to the extent of two inches, as Madame Boivin apparently believes, or to two and three-quarters and three inches, as M. Filugelli has more recently advanced; for, as elsewhere observed, these opinions result, in my estimation, from an error. The neck, in the commencement, being much lower, and directed more in front than in the ordinary condition, the finger can easily explore a larger extent of it, and thus an impression is created of an increase in its length which really does not exist; for frequent post-mortem examinations of females who died in the early months of pregnancy, have convinced me that, even if the neck is increased in thickness, its length does not undergo any appreciable augmentation.

At the commencement of the fifth month, according to most writers, the cervix begins to diminish. In the sixth month (they say) it begins to spread out at the superior part, so as to aid in the enlargement of the body of the womb, and this spreading at the upper part continues to advance in proportion as the term of gestation approaches, and consequently the length of the neck decreases from above downwards, so as merely to present at last, at the close of the ninth month, a ring of variable thickness. In fact, the diagnosis of the different periods was based on this gradual shortening, and, agreeably to the majority of the French accoucheurs who have adopted the opinions of Desormeaux, the neck has lost at the fifth month about one-third of its length, one-half at the sixth, two-thirds or three-quarters in the seventh, three-fourths or four-fifths in the eighth, and the remainder is effaced during the course of the ninth month; and yet, I do not hesitate to pronounce all this an entire error, which was first pointed out by M. Stoltz, in 1826, and to which I also have constantly asked attention since the year 1839. No; the neck does not shorten in the way which has so long been described; it preserves its whole length until the last fortnight of pregnancy; and it is an easy matter, especially in women who have previously borne children, to verify this remark, as we shall presently demonstrate. But during the last few weeks, its length, which until that time was intact, diminishes very rapidly, and even disappears by a total effacement; and we shall in due season explain the simple mechanism of this phenomenon.



A section, showing the neck of the uterus; the anterior and posterior lips are seen *in situ*, being separated from each other by the fusiform cavity of the neck.

But to return; I have frequently been enabled to prove, in primiparæ, the truth of M. Stoltz's assertions; for in these women the neck does diminish a little in length, during the last three months, although by a process entirely different from that described by Desormeaux. Thus, towards the seventh month, the ramollissement has invaded the whole intra-vaginal portion; the parietes of the neck, having lost their consistence, are easily separated by the liquids secreted upon their internal face, and the upper part of this portion being turned outwards, enlarges in such a manner as to cause the whole neck to resemble a spindle in its shape; the superior extremity of which is formed by the internal orifice (still closed), and the inferior is constituted by the external one, which is scarcely opened in primiparæ, even at the end of gestation, as we shall hereafter show.

Now, it is easily understood how this bulging of the middle part of the neck can only take place just in proportion as the two extremities of the latter approach each other; thus, of course, detracting so much from its total length. I do not believe, however, with M. Stoltz, that the approximation of the two orifices can be so great as to cause a material shortening of the neck, though this certainly does exist to some extent. The shortening of the neck is therefore real, though slight, in primiparæ; being accomplished, however, by a different mechanism from that taught by most authors. Its upper part does not spread out so as to contribute to the enlargement of the cavity of the body, but suffers a sort of collapse, which brings the two orifices nearer together, at the same time increasing its central cavity, and extending its transverse diameters at the expense of the vertical. What has been said concerning the rapid effacement of the neck during the last few days in multiparæ, equally applies to primiparæ; the process taking place by the same mechanism.

3. *Form.*—The principal modifications in the shape of the neck have already been presented, but they ought to be studied in a more special manner, according to whether they are found in primiparæ, or in women who have previously been mothers.

A. At the commencement, in primiparæ, the cervix appears more contracted and more pointed, resulting, perhaps, from the augmentation of its superior part in volume; the orifice of the os tincæ, which, before conception, presented a simple linear and transverse fissure, now assumes a circular form, constituting, as it were, a small lenticular fossa. A little later, as mentioned above, the middle part of the cavity of the neck enlarges, so as to give to the whole cervix the form of a somewhat elongated spindle, rather than that of a cone, which it previously had. It continues smooth and polished on the exterior surface, and the periphery of its orifice is rounded, without any irregularities or fissures; sometimes presenting a soft circumference, at others a thin and sharp border: the latter rarely happens, however, before a very advanced stage. At this time, it is very easy to ascertain what changes the neck has undergone, for although the external orifice is constricted, it is very much softened, and sometimes allows the finger to pass with a very slight effort and enter the cavity of the neck. The base of the last phalanx is then felt to be grasped quite tightly by the external orifice, whilst the extremity of the finger is at full liberty in the fusiform cavity of the neck. It may also be readily observed that the two orifices are still widely separated, for the entire length of the first phalanx and sometimes more, are capable of being contained in the cavity.

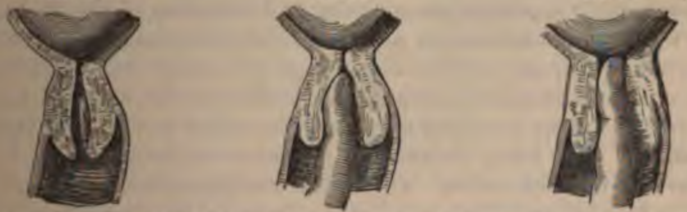


FIG. 40. FIG. 41. FIG. 42.

These three figures give an idea of the gradual dilatation which the cavity of the neck undergoes at various periods of pregnancy.

must be bent like a hook and be introduced from behind directly forwards. This posterior obliquity of the cervix, which differs essentially from that produced by an anteversion of the womb, sometimes renders it very difficult of access, even when the labor is somewhat advanced. The difficulty is still further increased, in some cases, by the softening of the neck throughout, in consequence of which it becomes flattened and applied to this tumor, forming a kind of fold or doubling on its posterior part.

Summary.—From what has been stated, we may now draw the following conclusions:

1st. That the tissue of the neck begins to soften at the very commencement of pregnancy, and the softening, although not very apparent in the earlier months, and limited to the most inferior part, gradually ascends, so as to invade successively the whole neck from below upwards, though it is sometimes less marked and less rapid in its progress in primiparæ than in other females.

2d. The cavity of the neck dilates simultaneously with the softening of its walls; and further, this enlargement causes it to be spindle-shaped in primiparæ; and, in females who have already borne children, to resemble a thimble, the finger of a glove, or a funnel with its base below.

3d. The external orifice remains either closed, or else very slightly open, in primiparæ, up to the very term of pregnancy, whilst in others it is widely open, and constitutes the base of the funnel.

4th. The whole length of the neck disappears in the last fortnight, being lost in the cavity of the body. The effacement beginning by the internal orifice and gradually involving the neck from above downward as far as to the external orifice.

5th. Contrary to the opinions generally adopted before the time of M. Stoltz's publication, the neck preserves its whole length until the last fortnight; it does not shorten from above downward during the last four months, but the fusion of the neck with the body takes place only within the last few weeks of gestation.

§ 3. MODIFICATIONS IN THE TEXTURE OF THE UTERUS.

Among the many changes which the womb undergoes during pregnancy, the most curious of all are those exhibited in its texture; and we shall study these by successively examining the different parts of its constituent elements.

1. *Serous Coat.*—The peritoneum, forming the external membrane of the uterus, spreads out in all directions. The various folds formed by it in the neighborhood of the womb, a species of mesentery, as M. Dubois calls them, such as the broad ligaments and the anterior and posterior ligaments, are double. Many anatomists believe this doubling is even sufficient to accommodate the enlargement of the organ. But, to refute this opinion, it is only necessary to examine that portion of it comprised between the commencement of the two tubes, which cover the fundus; for this will afford a convincing proof that it cannot be furnished by the accession of neighboring parts of the peritoneum, because, as Desormeaux remarks, the insertion of the tube and ligament of the ovary upon each side presents an obstacle that

will prevent the gliding of the adjacent membrane. The peritoneal tissue, however, undergoes a considerable extension, and a more active nutrition must necessarily take place to prevent its attenuation, since that which covers the uterus during gestation quite equals in its thickness the serous membrane of the unimpregnated state. This extension of the peritoneum, without a decrease in thickness, is not a new fact in pathology, and it may be seen in every hernia of considerable size.

The tissue uniting this membrane to the muscular substance appears to have diminished in density; for the peritoneal coat is movable on the muscular walls, according to M. Dubois, who has met with difficulty from this cause every time he has performed the Cæsarean operation.

2. *Mucous Coat.*—Although the existence of this coat in the non-gravid state has been denied by many anatomists, it becomes very apparent during pregnancy. It then grows redder and more vascular, and its folds disappear; but this unfolding will not alone account for the extension which it undergoes, and it must, whatever be said to the contrary, receive, like the peritoneum, a more active nutrition.

All the elements which we have mentioned (page 80) as entering into its composition undergo, in reality, a considerable development. The nature of this work does not allow us to enter into all the details which the subject demands, and we prefer referring the reader to the excellent work published by M. Robin, in the *Archives*, for the year 1848, Vol. XXV. of the *Memoires de l'Académie de Médecine*, and in the *Bulletin de l'Académie de Médecine*, 1861.

The glands of the body of the womb share in the general hypertrophy, and we shall be obliged to recur to this subject when we come to treat of the decidua, which is nothing else, as must be finally acknowledged, than the mucous membrane of the uterus modified by the progress of gestation. (See *Decidua.*)

It is easy to convince ourselves, after the accouchement, that the mucous membrane of the neck itself is also hypertrophied, though much less so than that of the body. Its glands, also, have undergone an enlargement, their secretion is much increased, and to it is due the gelatinous plug, that is to say, the elastic, dense, semi-transparent, and almost insoluble mass of mucus, which closes and fills the cavity of the neck during pregnancy. That such is the case may be demonstrated by examination of the bodies of women who die during pregnancy, when, if the mass be detached, prolongations will be found passing from it, and entering the orifice of the glands. (Robin.)

3. *Middle Coat.*—[The middle coat of the uterus is formed of muscular fibres of organic life, as stated whilst describing the normal anatomy of the organ. In the unimpregnated condition these fibres are hardly recognizable, but during pregnancy they become very evident. Numerous microscopic researches have shed still more light on the subject, revealing the most intimate changes which the muscular tissue undergoes. According to M. Ch. Robin, whose opinion is stated by M. Pajot, the muscular or cell fibres of the uterus are, in the empty uterus, remarkable for their small size and grayish color, making it difficult to distinguish them by the naked eye from the cellular texture which surrounds them. During pregnancy they enlarge in every way, particularly in length, and new fibres are formed beside the old ones, especially in the innermost layers of the middle coat.

must be bent like a hook and be introduced from behind directly forwards. This posterior obliquity of the cervix, which differs essentially from that produced by an anteversion of the womb, sometimes renders it very difficult of access, even when the labor is somewhat advanced. The difficulty is still further increased, in some cases, by the softening of the neck throughout, in consequence of which it becomes flattened and applied to this tumor, forming a kind of fold or doubling on its posterior part.

Summary.—From what has been stated, we may now draw the following conclusions:

1st. That the tissue of the neck begins to soften at the very commencement of pregnancy, and the softening, although not very apparent in the earlier months, and limited to the most inferior part, gradually ascends, so as to invade successively the whole neck from below upwards, though it is sometimes less marked and less rapid in its progress in primiparæ than in other females.

2d. The cavity of the neck dilates simultaneously with the softening of its walls; and further, this enlargement causes it to be spindle-shaped in primiparæ; and, in females who have already borne children, to resemble a thimble, the finger of a glove, or a funnel with its base below.

3d. The external orifice remains either closed, or else very slightly open, in primiparæ, up to the very term of pregnancy, whilst in others it is widely open, and constitutes the base of the funnel.

4th. The whole length of the neck disappears in the last fortnight, being lost in the cavity of the body. The effacement beginning by the internal orifice and gradually involving the neck from above downward as far as to the external orifice.

5th. Contrary to the opinions generally adopted before the time of M. Stoltz's publication, the neck preserves its whole length until the last fortnight; it does not shorten from above downward during the last four months, but the fusion of the neck with the body takes place only within the last few weeks of gestation.

§ 3. MODIFICATIONS IN THE TEXTURE OF THE UTERUS.

Among the many changes which the womb undergoes during pregnancy, the most curious of all are those exhibited in its texture; and we shall study these by successively examining the different parts of its constituent elements.

1. *Serous Coat.*—The peritoneum, forming the external membrane of the uterus, spreads out in all directions. The various folds formed by it in the neighborhood of the womb, a species of mesentery, as M. Dubois calls them, such as the broad ligaments and the anterior and posterior ligaments, are double. Many anatomists believe this doubling is even sufficient to accommodate the enlargement of the organ. But, to refute this opinion, it is only necessary to examine that portion of it comprised between the commencement of the two tubes, which cover the fundus; for this will afford a convincing proof that it cannot be furnished by the accession of neighboring parts of the peritoneum, because, as Desormeaux remarks, the insertion of the tube and ligament of the ovary upon each side presents an obstacle that

will prevent the gliding of the adjacent membrane. The peritoneal tissue, however, undergoes a considerable extension, and a more active nutrition must necessarily take place to prevent its attenuation, since that which covers the uterus during gestation quite equals in its thickness the serous membrane of the unimpregnated state. This extension of the peritoneum, without a decrease in thickness, is not a new fact in pathology, and it may be seen in every hernia of considerable size.

The tissue uniting this membrane to the muscular substance appears to have diminished in density; for the peritoneal coat is movable on the muscular walls, according to M. Dubois, who has met with difficulty from this cause every time he has performed the Cæsarean operation.

2. *Mucous Coat.*—Although the existence of this coat in the non-gravid state has been denied by many anatomists, it becomes very apparent during pregnancy. It then grows redder and more vascular, and its folds disappear; but this unfolding will not alone account for the extension which it undergoes, and it must, whatever be said to the contrary, receive, like the peritoneum, a more active nutrition.

All the elements which we have mentioned (page 80) as entering into its composition undergo, in reality, a considerable development. The nature of this work does not allow us to enter into all the details which the subject demands, and we prefer referring the reader to the excellent work published by M. Robin, in the *Archives*, for the year 1848, Vol. XXV. of the *Memoires de l'Académie de Médecine*, and in the *Bulletin de l'Académie de Médecine*, 1861.

The glands of the body of the womb share in the general hypertrophy, and we shall be obliged to recur to this subject when we come to treat of the decidua, which is nothing else, as must be finally acknowledged, than the mucous membrane of the uterus modified by the progress of gestation. (See *Decidua.*)

It is easy to convince ourselves, after the accouchement, that the mucous membrane of the neck itself is also hypertrophied, though much less so than that of the body. Its glands, also, have undergone an enlargement, their secretion is much increased, and to it is due the gelatinous plug, that is to say, the elastic, dense, semi-transparent, and almost insoluble mass of mucus, which closes and fills the cavity of the neck during pregnancy. That such is the case may be demonstrated by examination of the bodies of women who die during pregnancy, when, if the mass be detached, prolongations will be found passing from it, and entering the orifice of the glands. (Robin.)

3. *Middle Coat.*—[The middle coat of the uterus is formed of muscular fibres of organic life, as stated whilst describing the normal anatomy of the organ. In the unimpregnated condition these fibres are hardly recognizable, but during pregnancy they become very evident. Numerous microscopic researches have shed still more light on the subject, revealing the most intimate changes which the muscular tissue undergoes. According to M. Ch. Robin, whose opinion is stated by M. Pajot, the muscular or cell fibres of the uterus are, in the empty uterus, remarkable for their small size and grayish color, making it difficult to distinguish them by the naked eye from the cellular texture which surrounds them. During pregnancy they enlarge in every way, particularly in length, and new fibres are formed beside the old ones, especially in the innermost layers of the middle coat.

We quote the text in which Kolliker treats of the subject, viz.: "The muscular coat undergoes an increase in bulk, to which the enlargement of the uterus is principally due, an increase resulting from the concurrence of two phenomena: *the increase in size of the pre-existing muscular elements, and the formation of new ones.* The first of these is so marked that the contractile fibre cells, instead of being from .05 to .07 of a millimetre[1] in length, and .005 in breadth, which is their usual size, measure in the fifth month .14 to .27 m. m. in length, and .0055 to .014 and even .02 m. m. in width; in the second half of the sixth month .2 to .52 m. m. in length, .009 to .014 m. m. in width, and .005 to .006 m. m. in thickness; so that they are about from seven to eleven times longer, and from two to seven times wider than at first.

"*The formation of new muscular fibres* is especially noticed during the first half of pregnancy, and in the internal layer of the muscular coat. In this situation are found a multitude of young cells of from .02 to .04 m. m. in diameter, presenting all the transition forms of cell fibres of from .05 to .07 m. m. in length; nothing similar to this being observable in the external layers.

"This generation of muscular fibres appears to cease at the sixth month; at least I have been able to discover in the uterus during the twenty-sixth week of pregnancy only enormous fibre cells with no traces of preceding forms.

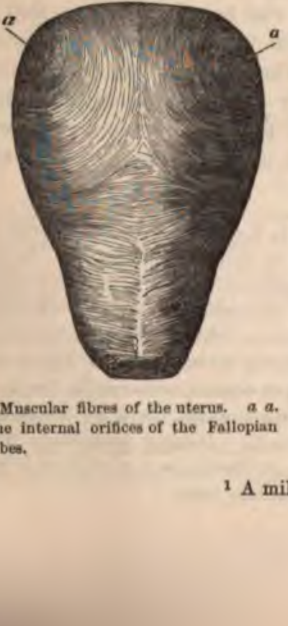
"To this increase of muscular fibres corresponds that of the connective tissue which unites them; toward the end of pregnancy the latter exhibits in some places a distinct fibrillation." (Human Histology.)

In short, the increase in size of already existing muscular elements, and the formation of new fibres, concur in the production of the uterine hypertrophy.

We have next to exhibit the arrangement and direction of the muscular fibres, and in so doing shall state successively the result of the dissections of Madame Boivin and of MM. Deville and Hélie.]

A. According to Madame Boivin, there are two planes of fibres in the body of the uterus—the one exterior, the other interior; the external plane is composed of fibres which run from the middle line outwards and downwards to the inferior third of the organ, where they terminate upon and aid in forming the round ligaments situated there, while the most superior ones are distributed to the Fallopian tubes and the ligaments of the ovary. An exact idea of the radiated disposition of the external fibrous planes, at the superior and lateral parts of this organ, may be formed by imagining the long hair of the human head to be parted along the whole middle line of the cranium, and then combed smooth on each side in front, and tied very tight opposite each ear.

Fig. 43.



Muscular fibres of the uterus. *a a.* The internal orifices of the Fallopian tubes.

Another muscular plane is found internally, having an entirely different arrangement; these fibres are circular and situated at the superior angles of the womb. They surround the internal orifice of the tubes (*a a*, Fig. 43), describing concentric circles, at first very small and close, but gradually separating as the distance from the angles increases, so that the last and largest border upon the median line, and spread out in the direction of its length.

---

[1] A millimetre is .0.039 of an inch.

Between these two planes, the external one composed of longitudinal, and the internal one of horizontal fibres, some other muscular fibres are found, the course of which it is impossible to trace.

Only a single order of fibres, which are semicircular, exists at the inferior part. They commence at the median line of this region, and reunite on the sides near the round ligaments.

I will remark, in terminating this short account of the uterine structure, its great resemblance to that of all the hollow organs, in having, for instance, its longitudinal fibres on the exterior, whilst the circular and horizontal ones are internal. The fundus uteri is the part particularly concerned in the expulsion of the fœtus, and it is there also that the muscular apparatus is the most developed; its disposition is such, that all parts of the uterine surface tend towards the centre during contraction. Lastly, at the inferior part, where the resistance should be least, there are only the horizontal fibres, constituting a sort of sphincter muscle, which may be compared, on more than one account, to the sphincter of the rectum or of the bladder.

B. Quite recently, M. Deville, prosector to the hospitals, has studied the muscular arrangement of the uterus in a great number of cases of females who died a few days after labor, and the results at which he has arrived differ much from those previously acknowledged. This subject, in my estimation, requires further examination; but whilst awaiting an opportunity of dissecting for myself, the preparations of M. Deville appear so satisfactory, that I have obtained a drawing of them, and introduce here the description furnished by that skilful anatomist.

Examined on its external surface, after the removal of the peritoneum and the compact resisting layer that separates this serous coat from the muscular fibres, the uterus seems to be composed of two orders of fibres, which are essentially muscular, one being transverse and the other longitudinal.

The transverse fibres *arise* (this word to be received in a purely descriptive sense) from three sources: the round ligament, Fallopian tube, and the ligament of the ovary; also from the wings of the corresponding broad ligament. The mere removal of the delicate peritoneal envelope of these organs suffices to bring the transverse fibres into view, and at the same time to reveal their muscular character.

The transverse fibres, together with certain vessels and nerves, constitute the intimate structure of the round and ovarian ligaments, as also the middle layer of the Fallopian tube, which is therefore essentially muscular, like the internal membrane, improperly called dartoid, of all the excretory canals.

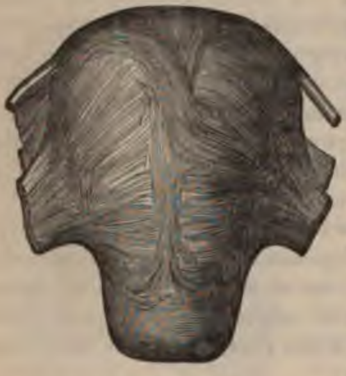
The presence of a great number of transverse uterine fibres lying in the thickness of the folds of the broad ligament, and extending to its base, is an important fact to be borne in mind; and the question arises, where do they terminate? I confess that I have not been able to determine this in a satisfactory manner.

However the truth may be, the transverse fibres coming from these divers origins spread out in a radiated manner over the whole exterior surface of the uterus, the anterior and posterior ones transversely, or a little downwards in an oblique direction, and the superior, obliquely upwards, so as to cover the organ completely. Near the median line these fibres are crossed perpendicularly to their course by a longitudinal fasciculus, more or less sinuous in character, and three-eighths to three-fourths of an inch wide, which arises near the point of union of the body with the neck, ascends upon the fundus of the organ, and descends on the posterior face, to be lost at its inferior part opposite to or a little below the point of beginning, that is, near the union of the body with the neck. A positive continuity will be observed between the transverse fibres of each side and the middle longitudinal fasciculus, if the line of contact be carefully examined.

As the transverse fibres arrive near the median line, some curve downwards, others upwards, so as to become longitudinal, and thus constitute the median layer. This is particularly evident at its termination, both in front and behind, for the whole fasciculus divides there into two portions, one of which curves to the right, the other to the left, and becomes continuous with the most inferior transverse fibres of the body.

This continual exchange of the two series of uterine fibres takes place with such great uniformity, that the longitudinal fasciculus has nearly the same thickness everywhere; but if this lamina be more patiently examined, it will be found to be composed of very short longitudinal fibres, forming the central part of a letter X, which the uterine fibres describe, as I have verified on many of my preparations, in the following manner.

FIG. 44.



The disposition of the muscular fibres on the anterior face of the womb.

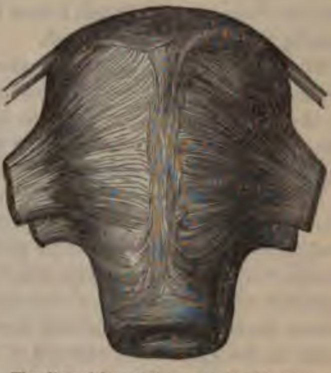
Let us take a layer of transverse fibres on the *right* side of the uterus, at the anterior inferior part (see Fig. 44); this fasciculus nearly approaches the median line, then curves upward and becomes confounded with the longitudinal lamina; then, after a vertical course, varying from one-third of an inch to two inches, it again curves to the *left*, to reassume a transverse direction, thus representing a Z, or still more exactly, a branch of the letter X.

Thus, the longitudinal median layer is produced by the union of the central and vertical branches of the X, described by the uterine fibres.

It sometimes happens, however, that the transverse fibres pass directly from right to left without forming the vertical branch, which fact should be borne in mind lest this arrangement existing on the surface might give rise to a belief of the absence of a median longitudinal fasciculus; whereas, if the latter is not evident, it will only be necessary to raise carefully this layer of median transverse fibres, to bring it into view. The uterus exhibits the same disposition of muscular fibres on the internal face, which will readily account for the error of Madame Boivin, who described them as circular.

Notable differences, however, exist between the fibres on the two surfaces of the organ. The most remarkable on the exterior is the extreme breadth of the longitudinal fasciculus, which covers the whole fundus, extending from the orifice of the Fallopian tube on one side to the same point on the other. When this fasciculus reaches the anterior and posterior faces, it is intersected at right angles by the transverse fibres occupying the lateral portions just below the orifice of the tubes, which act there as on the exterior surface: that is, some of the fibres curve upwards, others downwards, becoming confounded with the longitudinal layer. Lower down, near the junction of the body with the neck, the longitudinal fasciculus is very irregular. Sometimes it exists; sometimes, though more rarely, it does not.

FIG. 45.



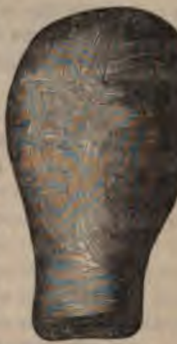
The disposition of the muscular fibres on the posterior face of the womb.

At this point, in fact, the continuation, or inter-crossing of the transverse fibres from one side to the other, occurs in an irregular manner, either forming the vertical branches of an X, or taking an oblique direction, or again going directly across, the fibres preserving a transverse course.

A third layer exists between the two just described, but I am not sufficiently acquainted with the disposition of its fibres to give an exact account of them.

All these particular details do not interfere with the general law of *inter-crossing*, or passage of uterine fibres from one side to the other, and in this respect, the uterus may justly be ranged in the same class with all the other hollow muscular organs whose structure is also regulated by the fundamental law of *muscular inter-crossing*. Hence, it would not be difficult to demonstrate that the human uterus, as just described, approaches in its structure quite as well, perhaps better, to that of the same organ in other mammiferæ, than the arrangement pointed out by Madame Boivin. But such a discussion would be out of place here.

FIG. 46.



Shows the inter-crossing of the uterine fibres.

In conclusion, I will observe, that the same dispositions in the muscular arrangement are found in the neck and inferior part of the body. Inter-crossings occur there also, the fibres passing directly from one side to the other, or becoming more or less oblique at the moment of crossing, and still oftener forming the branches of an *x* with the median vertical parts. This last disposition gives rise to the peculiar formation, which has improperly been called the *arbor vitæ*.

[c. Lastly, M. Hélie, Professor in the Medical School at Nantes, has, in a remarkable memoir written after long and skilful dissections, discussed anew the subject of the muscular structure of the uterus.

As M. Hélie seems to represent the true state of the case, and gives a better and more complete exhibition of the arrangement of the muscular fibres than has hitherto been done, we shall follow his description whilst pointing out the principal results at which he has arrived.

The fibres of the uterus, like those of the heart, are disposed in layers, which cover and envelop each other successively. Fibres pass frequently from one layer to the other; their arrangement is intricate, and their dissection very difficult. These superposed layers form the muscular structure of the uterus, and we shall describe successively the external, the internal, and the middle layer.

The *external layer* is composed of several alternate planes of longitudinal and transverse fibres. The most superficial plane is longitudinal, and is formed of a median fasciculus whose middle part is curved like a loop upon the fundus of the uterus, whilst its two extremities descend, one upon the posterior and the other upon the anterior surface of the organ. This loop-like fasciculus (Figs. 44 and 45) always descends further behind than in front. Behind, it begins where the neck joins the body, and is composed of fibres which, from being at first transverse, by a sudden change of direction become vertical, as shown by M. Deville. As it ascends, the fasciculus is reinforced by other fibres bent in like manner. As it approaches the fundus, the lateral fibres curve outward toward the Fallopian tubes and broad ligaments upon which they disappear.

The middle fibres of the fasciculus are, therefore, the only ones which bend over the fundus of the organ, and descending upon the anterior surface curve successively outward to reach the broad and round ligaments.

A portion of the fibres which thus emerge from the loop-like fasciculus, reach the lateral parts of the organ only after having traversed its median line and passed from one side to the other. From the right side, they proceed to the left angle or to the left side of the anterior surface; those, which at their origin belong to the left side, go to the right angle, or to the right side of the anterior surface of the organ.

These crossed fibres follow, therefore, precisely the Z-like direction described by M. Deville. M. Hélie, however, regards the crossings as far from constant, besides being limited to very few fibres; the greater number of the looped ones beginning and ending upon the same side without crossing the median line.

The loop-like fasciculus is almost never limited to one plane only. It is always thick upon the posterior surface of the uterus, sometimes, though rarely, forming a single plane. At other times, and most commonly, its fibres are divided into two planes separated by a layer of transverse fibres, the superficial layer being then thin, and the deeper one much thicker.

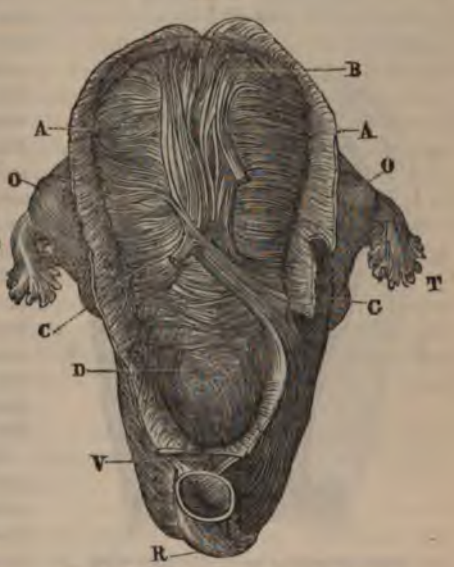
Let us study next those transverse fibres which, with the preceding fasciculus, form the surface of the body of the uterus. They constitute the greater part of the external muscular layer, and contribute to the formation of the loop-like fasciculus as already stated; the greater part, however, being foreign to its formation remain upon the median line, passing below it and between its two layers, sometimes even upon its superficial posterior layer. They go from one side to the other, extend outwardly into the broad ligaments, and especially into the ligament of the ovary, the round ligaments, and upon the Fallopian tubes.

If we follow them in the opposite direction, they may be said to proceed from all these points, and after reaching the sides of the uterus to divide into two layers, one of which passes upon the anterior, and the other upon the posterior surface of the organ, the uppermost covering the fundus and making arch-like curves upon the angles.

Some of the fibres leave the external layer and pass into the middle one.

It should be observed that the anatomists who have studied the muscular structure of the uterus have failed to treat of the sides of the organ, mentioning only those fibres which extend to its annexes; an omission which M. Hélie has supplied.

Fig. 47.



Second plane of the anterior muscular layer.
A. Superficial layer divided and folded over upon the sides of the uterus. B. Deep layer of the loop-like fasciculus. C. Transverse fibres emerging from the loop-like plexus. D. Fibres of the neck. O. Ovary. R. Rectum. T. Fallopian tube. V. Bladder.

If the two layers of the broad ligament with the muscular fibres distributed to it be separated, transverse muscular fibres going from one surface to the other, are perceived throughout the entire vertical extent of the sides of the uterus. At the sides of the uterus, these fibres are so curved as to reach the surface opposite to the one from which they took their departure. Such at least is their general arrangement, though their course is a very complex one. They separate to afford passage to the vessels, and do not keep to their primitive plane throughout their course. Thus in front they are superficial, but are more deeply situated behind, and *vice versa*.

Above, and on a level with the Fallopian tubes, the fibres of the sides of the organ are arranged still differently. The transverse ones which describe large curves upon the fundus from one angle to the other, descend and curve again upon the sides of the organ. A portion of these go to the Fallopian tube, and to the round and ovarian ligaments, the major portion, however, descend upon the sides of the uterus.

In their descent they meet the vessels which interrupt their regularity, then they pass more deeply and curve forward or backward to become transverse upon one surface or other of the organ.

In the neck, the arrangement of the fibres is more simple, for no trace of the loop-like fasciculus is found. Almost all the fibres pass somewhat obliquely downward from the sides of the uterus toward the median line, where they interlace with similar fibres from the opposite side. They pass upon the sides of the neck and curve round from one surface to the other in the same way as on the body, the most superficial passing outward with the vesico-uterine and recto-uterine folds, as also with some fibres of the bladder, and still lower with the muscular fibres of the vagina.

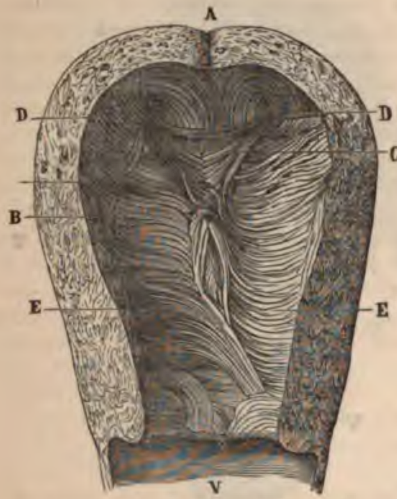
Internal Layer.—When the uterus of a woman deceased just after delivery is opened, the muscular fibres of the body are found deprived of the mucous membrane which had covered them, and which had been transformed into the decidua. As the mucous membrane had not undergone this change in the neck, it there still covers the muscular fibres, and is closely united to them.

When the uterus is opened by incision, the middle of the posterior wall is found to present uniformly a slightly projecting triangular fasciculus, the base of which extends from one Fallopian tube to the other, whilst the apex reaches to the internal orifice of the neck.

This book is the property
COOPER MEDICAL COLL
SAN FRANCISCO, CAL.
and is not to be removed f

This triangular fasciculus is formed as the loop-like one: of horizontal fibres which curve suddenly upward, and what is singular, the new fibres which reinforce it are always added to its left side, whilst from its right side fibres successively emerge which become transverse by passing to the right side of the womb. These fibres have precisely the form of the letter Z.

Fig. 48.



Internal muscular layer. (Anterior wall.)

A. Section of the uterine walls. B. Triangular fasciculi. C. Fibres passing to the Fallopian tubes. D. Openings of the Fallopian tubes. E. Transverse fibres. V. Vagina.

In approaching the Fallopian tubes, the triangular fasciculus divides into two small thin ones, of which one on each side has its acute point inserted into the corresponding Fallopian tube, where it suddenly comes to an end. Finally, transverse fibres extended directly from the orifice of one tube to the other, complete the triangular fasciculus by forming its base. (D. Fig. 48.)

A precisely similar triangular fasciculus exists upon the anterior wall, with the single difference that the transverse fibres whilst curving to a vertical direction enter its right side, whilst from its left side fibres emerge which assume a horizontal direction in order to reach the left side of the womb.

Upon the sides of these triangular fasciculi, throughout the whole vertical extent of the body of the uterus, the muscular fibres of the internal layer have a transverse direction, and pass from one surface to the other. As they approach the middle of the anterior and posterior walls, some undergo an inflexion to form the triangular fasciculus, whilst others in much greater number pass beneath it, and continue their transverse direction. At the internal orifice of the neck the transverse fibres form a projecting fasciculus, which defines sharply the cavity of the body and that of the neck.

At the fundus of the uterus, that is to say, above the orifices of the Fallopian tubes, the muscular fibres form arches directed from before backward, which constitute the vault of the cavity. Descending thus upon the anterior and posterior surfaces, they pass beneath the transverse band of the triangular fasciculus which covers them, and finally curve and become blended with the horizontal fibres.

At the orifices of the Fallopian tubes, the fibres of the internal layer are disposed in concentric rings; the smaller being in contact with the orifice, whilst the larger, often imperfect, are continuous with the arches of the vault, touching back to back those of the opposite side as described by Madame Boivin.

At the neck, it is necessary to remove the mucous membrane in order to see distinctly the muscular fibres. It is then evident that the projection of the arbor vitæ is formed by muscular fasciculi whose fibres separate on each side to form superposed arches. Near the external orifice the fibres of the neck are almost all annular and interlaced.

Middle Layer.—When the progress of the dissection has removed successively the loop-like fasciculus and the different planes of transverse fibres which compose the external layer, the middle layer, presenting an entirely different arrangement, is reached.

Between these two layers, however, there is no precise line of demarcation, the deep fibres of the external layer assuming gradually the arrangement peculiar to the middle layer. Therefore, only after the removal of these intermediate laminæ, can the middle layer with all its peculiarities be clearly distinguished. The same observation applies to its exhibition by the entire removal of the deep layer.

The middle layer, first indicated by the great number of vessels which it contains, is always thicker in the part corresponding to the insertion of the placenta. It is composed of bands of variable width, crossing each other in all directions, some being transverse, others oblique, and some again longitudinal. Large orifices traversed by the veins or sinuses separate these bands from each other or even the fibres of the same band. The muscular fasciculi are curved in loops around the uterine veins, each loop being crossed by another forming with it a complete ring which surrounds the vein; a succession of rings forming a canal for the vein. Large rings produced in the same way inclose several veins, each of which has its special rings within the principal one. Most frequently, the loop-like fasciculus forms but the half or two-thirds of a circle, another fasciculus completing it by crossing its extremities, at the same time becoming closely attached to them.

Each vein is therefore surrounded by annular contractile fibres, and traverses a true contractile canal in its course through the middle layer. The arteries, like the veins, are surrounded by muscular rings, with this difference, however, that the arteries are free within the rings, whilst the veins, reduced to their internal membrane, adhere to the muscular fibres.

According to M. Hélie, the middle layer is found only in the body of the uterus and is absent in the neck. The latter, therefore, is formed simply by the superposition of the external and internal layers.]

4. *Vascular Apparatus.*—Towards the end of pregnancy, the uterus exhibits an astonishing development of its vascular system. My friend, Dr. Jacquemier, has for fifteen years paid much attention to this subject; the results of his labor as found in his work are important, and from them I draw largely. "In studying the development of the vascular system in its whole extent, we shall find," he says, "that the augmentation in the size of the arteries only becomes considerable as they approach the uterus. Whilst advancing between the peritoneum and the external face of the organ, and before giving off their first divisions, they dilate and swell up, and then they furnish branches to the anterior and lateral parts, which ramify *ad infinitum;* they are not situated immediately below the peritoneum, but are separated from it by a delicate layer of muscular tissue. All these ramifications anastomose freely and penetrate through to the internal surface, where they generally terminate; but a large number of those, corresponding to the placental insertion, traverse the mucous membrane and enter the placenta. The ramifications of the arteries are continuous with the capillaries, which in their turn give origin to the veins. That the capillary vessels become enlarged during pregnancy has been proved by Virchow; and Jacquemier found that they were more readily injected than capillaries are under ordinary circumstances. This fact explains the activity of the uterine circulation, as also the rapid and profuse discharge of blood from the arteries into the sinuses.

If the venous trunks be examined, from the point of quitting the uterus to their terminations in the hypogastric vein and in the vena cava inferior, a great increase in capacity will be noticed, for the ovarian veins are almost as large as the external iliacs, and the uterine are but little less. In the substance of the womb, the venous system presents itself as a series of canals, situated in the centre of the muscular tissue, at nearly an equal distance from the internal and the external faces: at this point, the uterus is traversed by a great number of canals coming from all directions, which anastomose, and form large sinuses at their junction; the whole constituting a grand plexus, several divisions of which are large enough to receive the extremity of the little finger.

These canals are much larger opposite the insertion of the placenta than elsewhere, and they diminish in size as they recede from it. There is a certain portion of the uterine walls, determined by the placental insertion, where the venous canals of the uterus traverse the mucous membrane in order to be distributed to the placenta. (See *Decidua* and *Placenta.*) There, in the thickness of the inter-utero placental decidua itself these vessels form, through an enormous dilatation of all their branches, the large sinuses which exist at the adherent surface of the placenta. These sinuses communicate so freely with each other as to form, so to speak, a pool of blood, divided up by numerous partitions. A proportionably small number of orifices exist at intervals, through which this reservoir of blood communicates with the sinuses of the muscular walls. When the afterbirth is detached, the whole placental surface of the uterus is found to be riddled with holes, which look as though they had been made with a punch. These orifices, which are oblique, like the section of a quill in making a pen, close of themselves through the depression of one of the membranous lips of the opening against the other. (See *Placenta.*)

When we come to treat hereafter of the decidua, we shall find that the arrangement of the vessels of the mucous membrane properly so called, undergoes changes during the course of gestation; the vascular network of the internal surface, which is highly developed in the early stages, showing signs of a commencing atrophy at the end of the second month, and diminishing to vessels of very small calibre by the end of the pregnancy.

A very delicate yet distinct web of areolar tissue envelops the uterine arteries. The veins, on the contrary, have only their internal coat, which adheres intimately to the muscular substance, and no valves are found in their interior.

So great an enlargement of the arteries and veins must be due to something more than a mere unfolding, since they preserve their flexuosities which are increased rather than diminished. They must, therefore, undergo a change analogous to that which takes place in the fleshy tissue of the organ.

From what has been stated, it is evident that the blood flows to the uterus in very large quantities, and consequently its nutrition is augmented, for such an amount of blood must certainly contribute to the growth of its walls. But the question then arises, is the circulation much more active, as many authors have thought? In reply, it would appear from the late researches of M. Jacquemier, that the venous circulation especially must exhibit an unusual slowness, but I confess the reading of this last part of his memoir has not convinced me on that point. (See art. *Hemorrhage.*)

The lymphatic vessels also acquire a very considerable calibre and form several planes in the uterine substance, the superficial of which are the most developed; they divide into two groups, those of the neck, which run to the pelvic ganglia, and those of the body, going to the lumbar ganglia. The hypogastric absorbent trunks, according to Cruikshank, who has described and figured them, are as large as a goose-quill, and the vessels themselves so numerous, that, when injected with mercury, the uterus appears to be a mass of lymphatic vessels. A common dissection, made a few days after delivery, will afford convincing proofs of their volume and number.

5. The *nerves* of the womb have, of latter time, been the subject of numerous researches, among others, by Drs. Robert Lee, Jobert, Rendu, and Boulard. Agreeably to the latter anatomists, whose conclusions closely correspond with those of the English accoucheur, the nerves are derived from three sources: 1st. From the ovarian plexus—few in number, and distributed to the angles and fundus uteri. 2d. From the hypogastric plexus—these are specially destined to the neck; and 3d. Some filaments of the great sympathetic, which accompany the uterine arteries, and are apparently lost upon the neck and lateral parts of the womb. Among the filaments constituting the ovarian plexus, there are a few which seem to follow the course of the blood-vessels passing near the ovary, and reaching the border of the uterus at its superior part. The filaments then penetrate into its substance along with the vessels, apparently for distribution to the muscular walls.

The hypogastric plexus furnishes some nervous filaments as the urethra crosses its anterior part; these nerves are few in number, and ascend along the lateral portions of the neck (but *not* following the vessels), giving off branches here and there which enter the uterine walls, but M. Rendu has not been able to trace them beyond the neck. These nerves differ essentially from the preceding, both in origin and distribution, for they come from a plexus whose branches are not distributed with the vessels, and which has frequent anastomoses with the sacral nerves or *nerves of animal life*.

The whole body of the uterus, therefore, receives the nerves of organic life exclusively, whilst the nervous apparatus of the neck alone has communications with the spinal nerves. Like the lymphatic and sanguineous vessels, the nerves, according to some authors, undergo a considerable development during gestation. In the preparations exhibited by Robert Lee to the inspection of the Royal Society, and also in the two figures given by him, large nervous bands are seen below the serous tunic, and these bands are so voluminous that many anatomists have doubted their true structure, and regarded them as furnished by a gelatinous or cellular membrane, placed between the peritoneum and the muscular coat. Consequently, in accordance with this view, the uterine nerves do not form an exception, as was for a long time supposed, to the hypertrophy seen in all other parts of the organ during pregnancy—for they likewise are developed in every way, and return after the delivery to their normal size. (See, for further details, the memoir of Dr. Robert Lee, "*On the Ganglia and the other Nervous Structures of the Uterus.*") It is generally admitted, however, that the neurilema is the part chiefly affected by the hypertrophy.

The preparations deposited by M. Boulard in the Museum of the Faculty, and the works of Robert Lee, Ludovic Hirschfeld, and Richet, have convinced us, that exceedingly fine filaments are prolonged even to the lowest parts of the os tincæ, and, consequently, that no portion of the organ is entirely destitute of them.

ARTICLE II.

CHANGES IN THE PROPERTIES OF THE UTERUS.

[*Sensibility.*—The sensibility of the uterus undergoes little alteration. It is well known that in the unimpregnated state the neck may be touched almost without the woman being aware of it, and it may even be cauterized without giving rise to definite pain. The same observation is almost applicable to the organ in the pregnant condition, so that it were wrong to suppose that its sensitiveness is much increased during gestation. The sensibility varies, however, with the cause which excites it; a forced distention, for example, seeming to us to give rise to considerable pain. To avoid exaggeration, it may be said that sensibility exists in the neck, but is obscure during as well as before pregnancy.]

The body of the uterus appears to be even less sensitive than the neck. I am aware that most women feel the motions of the child, but are these movements perceived by the walls of the abdomen, or by the uterine parietes? The fact that in women affected with ascites, the active motions are much more obscure than in other females, tempts us to accept the former hypothesis. I have, besides, frequently known women to pass through the whole course of gestation without feeling the motions; for instance, I saw a patient at La Charité, in August, 1839, who, although advanced to seven months, doubted her pregnancy because she had not felt the child stir. I saw her frequently afterward between this time and near the last of October, when her labor occurred, yet, although the child was quite strong and healthy, she had never observed its motions.

[The body of the womb must not, however, be regarded as entirely insensible, for the contractions of labor or the introduction of the hand give rise to quite severe pain. We shall recur to this subject when studying the subject of the pains of labor. (See *Phenomena of Labor.*)

Irritability.—Having treated of its sensibility, we have a few words to say of the irritability or organic sensibility of the womb, meaning thereby the vital activity peculiar to the nervous system of the uterus, and other parts supplied from the same source.]

This irritability is notably increased during gestation: to it is due the kind of sympathetic relation which is established between the fibres of the neck and those of the body of the uterus, and in consequence of which, any rather active and prolonged excitement of the neck of the organ reacts upon the fibres of the fundus.

Even the premature expulsion of the fœtus is often a consequence of contractions produced by excitations of the cervix, and it is owing to this cause, according to Delamotte, that repeated coition has frequently caused abortion, and that females who are used in our amphitheatres for practising "the touch," are so often delivered before term.

This irritability of the cervix, and its influence upon the contractility of the body is in some cases turned to profit in the practice of our art; thus it is well known, that one of the surest and most generally employed methods of inducing premature labor, consists in the introduction and retention of a foreign body in the neck of the womb.

[*Contractility.*—By this is meant the power with which the fibres of the womb are endowed of closing upon the body which it contains for the purpose of expelling it from its cavity. It is a true contraction, precisely similar to the muscular contraction of all hollow organs, such as the bladder, rectum, or stomach.

The power of contraction exists even in the unimpregnated condition, especially at the menstrual periods; at which time, in exceptional cases, it gives rise to the severe pain experienced by those who suffer from dysmenorrhœa. During pregnancy, the uterine contractility becomes more evident though still feeble and painless; during labor only does it acquire its full energy, and is then productive of intense suffering.]

The pain which, during labor, accompanies the uterine contraction, is usually very great in the human species, but does not exist at all in wild animals, and is only observed to a very feeble degree in our domesticated ones. As a general rule, the uterine contraction is not painful in the different species of animals, unless an accident or some disease renders a greater energy of action necessary on the part of the organ, and the pains then experienced by the female are altogether similar to those of women.

If, therefore, the contraction is only painful accidentally, as it were, in animals and merely in consequence of a particular morbid condition of the uterine fibre, are we not justified in referring the pain in the human species to the same cause? Now can this predisposition be the result of the refinements of civilization? It would of course be impossible to prove this, but there are strong grounds, at least, for believing that such is the fact, when we reflect that our domestic animals, which, like ourselves, have been translated from their primitive normal condition, often suffer much more during parturition than those in a savage state.

This contractility resides in all the muscular fibres of the womb, both body and neck, though the great development of the muscular layers of the body causes the contraction to be most powerful in that portion. Its intensity is exceedingly variable in different females, being very strong in some, and scarcely existing in others; but its energy bears no relation to that of the external muscular system, for some strong muscular women have extremely weak contractions during labor, and oftentimes the contrary is observed.

The exercise of this function takes place independently of the will, at least in a great majority of cases, which indeed we can readily understand must be the fact, from the origin and nature of the nerves distributed to the body of the uterus, since we have just learned that its fundus receives filaments from the great sympathetic alone. I am well aware the books furnish some cases of women who had the power of suspending the contraction at will; but if the facts have even been well observed, they have failed perhaps to receive the most rational interpretation. In the cases related by Baudelocque and Velpeau, in which the labor ceased when the students were summoned to witness it, and began again when these numerous observers retired, the will had probably less to do than the imagination and modesty, with the alternations of retardation and acceleration; for though the influence of the will may be reasonably doubted, it cannot be denied that moral disturbances appear to affect the contractility of the uterus; thus, a violent emotion has often sufficed to arouse it long before the ordinary term of gestation, and it is not at all uncommon for the contraction to diminish or disappear for several hours, or even days, under the operation of such causes. Dewees knew the pains to be suspended in this manner for two weeks in a woman who was greatly affected by his sudden and unexpected arrival. Betschler cites a case in which the pains were suddenly suspended by a violent tempest, so that the neck, though widely dilated, closed again, nor did the labor recommence until nineteen days had elapsed.

Every day, indeed, we witness a suspension of the pains for half an hour, and sometimes even for several hours, upon visiting women whose modesty is shocked by our presence.

The exercise of this function is seldom of long duration, lasting for a few seconds only—rarely beyond one or two minutes, and then the organ which was so strongly contracted and hardened, gradually regains its primitive state, and remains in repose, until, under the influence of the same stimulus, it is again thrown into action. The organic contractility, like all muscular power, is expended by a prolonged exercise, and hence we can understand why the pains so often become at once more slow and feeble or even cease altogether after a prolonged labor. Lastly, opiates have a marked influence over them; for by employing these preparations, we may suspend the uterine contraction nearly at will, for several hours during labor at term, and indefinitely, in a case of premature delivery or abortion.

This contractility may be excited by natural, accidental, or artificial stimuli: thus, all the causes of labor constitute the first; the second are those of abortion and premature labor; and the third comprise all irritation whatever of the neck or body of the womb; as electricity, ergot, and, in a word, all the means employed when it is desirable to deplete the organ. On the contrary, it may be weakened by an over-distention of the uterus, by prolonged contractions, or vivid moral impressions.

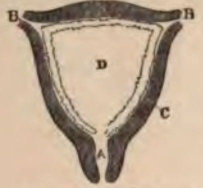
An observation of M. Brachet's might lead to the supposition that the contractility of the uterus would be weakened, or even totally destroyed, by lesions of the spinal marrow. Experiments upon animals have, besides, shown that complete destruction of the cerebro-spinal axis abolishes the senso-motor functions of the great sympathetic nerve. The uterus would, therefore, be paralyzed in an experiment of this kind. It is, however, proved by numerous cases of paraplegia in females, as well as by experiments on animals, that labor is in no respect impeded by alterations of the cord, that the uterus continues to contract, and that the want of action of the voluntary muscles is largely compensated for by the paralysis of those of the perineum, the slight resistance of which renders the last stage of the fœtal expulsion both more easy and rapid.

This result might indeed have been anticipated from the known absence of all nerves of animal life from the body of the uterus.

The contractility of the uterus, like that of all the viscera of organic life, the smaller of which is in contact with the ovum, and surrounds the greater part of its external surface; the other, and by far the larger portion, is entirely free, and must, when the ovum was still within the uterus, have been applied to the internal surface of the womb. This external surface is very irregular, and thickly studded with small and tender filaments.

The portion of this membrane in contact with the ovum, was at first termed the *ovular decidua*, and afterwards, as suggestive of the way in which it was supposed to be formed, the *decidua reflexa;* the other was called the *uterine* or *parietal decidua*, on account of its relation with the wall of the uterus.

FIG. 50.



A section of the womb exhibiting the decidua *in situ*, before the arrival of the ovum (old theory). A. The cavity of the neck. B B. Orifices of the Fallopian tubes. C. The decidua. D. The cavity of the deciduous membrane.

Now, what is the nature of this membrane? What is the mode of its formation? At what period is it developed? To furnish replies to these questions the following theory was imagined, which theoretically furnishes quite a good solution of all the difficulties of the case.

As previously stated, the uterus, like all the other genital organs, becomes the seat of a more active vitality immediately after a fruitful coition; in consequence of which the blood flows there in increased quantity, occasioning a congestion and turgescence of tissue, not far removed from inflammation. This abnormal excitement is always accompanied by the secretion of coagulable lymph, a sero-albuminous fluid, which soon fills up the uterine cavity. In the course of a few days the fluid thickens, and its exterior particles, by becoming more consistent, form a soft pulpy membrane, which lines the whole internal surface of the womb; thereby constituting a true sac, that is in contact externally with the mucous membrane throughout, and is filled by the uncoagulated portion of the fluid. From its position, this pouch must evidently assume the shape of the uterine cavity upon which indeed it seems to be moulded (Fig. 50).

The fecundated ovule does not reach the cavity of the womb until after the lapse of eight, ten, or even twelve days, from the time of fecundation, but the membrane just spoken of begins to form much earlier. The consequence is, that after the ovule has traversed the tube, it finds the internal orifice closed by the decidua, and evidently can only pass between it and the uterus by pushing the membrane before it. From this time, the decidua presents two distinct layers, the most extensive of which lines the internal surface of the uterus, except at the point occupied by the ovum; it is called the *external* or *uterine decidua*. The other, which is pressed inward by the ovule, and is therefore in contact with a greater or less extent of its external surface, is termed the *internal* or *reflexed decidua*, the *ovular decidua*, and the *epichorion of Chaussier*.

These two layers are at first widely separated from each other; but as the ovum increases in size, the extent of the reflected decidua is necessarily augmented and the cavity diminished, so that by the fourth month the latter has disappeared, and the parietal and ovular layers come in contact.

The ovum is in immediate contact with the uterine mucous membrane

The retractility is far from being equally powerful in all women, nor is it always easy to give a good reason for the difference. For example, it is much less active in multiparæ than after a first labor, and this explains why after-pains are much more common with the former than in the latter case, for the pains are a consequence of the exercise of the contractility, and the uterus returns more slowly to its habitual volume. Great over-distention of the womb, and a too rapid or too prolonged expulsion, also seem to diminish its action.

If it be indisputable that there are circumstances which diminish the elasticity of the uterine fibres, it is also fully proved that we possess certain agents capable of exciting its action. Thus, external or internal irritations acting on the neck and body (such as cold or frictions), and the administration of ergot, often have this happy effect.

ARTICLE III.

CHANGES IN THE NEIGHBORING PARTS.

We can readily imagine that the modifications just studied do not take place in the uterus without affecting the neighboring parts, and the changes in these will next engage our attention.

1. As the uterus gradually rises in the abdomen, its surrounding peritoneum is carried along with it; the folds, called the *broad ligaments*, then disappear, and consequently the Fallopian tubes and ovaries are drawn nearer to the body of the uterus, where they lie very nearly in a vertical direction; the fundus becomes rounded, its angles diminish and finally disappear. The Fallopian tubes, which in the unimpregnated state are inserted at the apex of the angles, and on the same horizontal line with the fundus, are no longer implanted upon the highest part, but correspond to the upper fourth, or even to the middle of the total length of the organ. The round ligaments are then composed of short linear fibres, among which a great number of muscular ones, prolongations of those of the uterus, and having the same contractility, may be distinguished. M. Velpeau asserts that he discovered and watched their contraction in three different females, during the efforts of the uterus to expel the after-birth. The greater development of the anterior than of the posterior wall of the uterus, removes the insertion of the round ligaments from the lateral position which they occupy in the unimpregnated organ, to a point so much farther in front, that they are implanted at about the union of the anterior fifth with the posterior four-fifths of the antero-posterior diameter.

2. As the womb and upper part of the vagina are intimately associated, the latter is necessarily shortened as the former enlarges in the early periods of pregnancy, whilst the vagina becomes longer when the womb rises above the superior strait. The venous system in the vaginal walls is considerably developed, owing to the greater activity of their circulation. This dilatation of the veins is, doubtless, the consequence of a greater vitality in the genital organs, but it is also due in part to the stasis of the blood, which is impeded in its course by the uterine development.

The varicose state, and the nodosities frequently encountered by the finger on the vulva and vagina towards the end of pregnancy (described by M. Deneux under the name of *thrombus*), which certainly predispose females to hemorrhagic accidents, may probably be attributed to the same cause; and this congestion even affects the capillaries; for otherwise it would be difficult for me to explain the livid spots or discolorations, resembling wine-lees, presented by the vaginal mucous membrane, and to which attention has again been recently called as affording a sign of pregnancy.[1] But unfortunately this sign can only be serviceable in a medico-legal case, because in private practice very few females would permit such explorations.

In practising the "touch," the finger frequently detects some arterial pulsations at the upper part of the vagina, though they are more frequently found on some point of the supra-vaginal portion of the uterus, and are evidently due to the great hypertrophy of the vaginal and uterine arteries. Doctor Osiander, of Göttingen, attaches great importance to this as a diagnostic sign, and has called it the *vaginal pulse*.[2]

It is not uncommon to find the mucous membrane of the vagina covered, about the seventh or eighth month, throughout its whole extent, with myriads of little pimples as large as a pin's head. These small granulations, which I have frequently met with, always coincide with a marked increase of the vaginal secretion, and have given rise to the term granular vaginitis of pregnant women.

The vaginal mucosities are always secreted abundantly during pregnancy, but the time of their appearance is very uncertain. Usually, however, they are more copious in the advanced stages, and the women then say, "they are losing the milk;" an opinion unworthy of refutation. In some, this flow appears in the early months, then ceases, and again reappears several times; though perhaps not at all, or else only at a very late period.

3. The bladder is gradually pushed above the superior strait, the meatus urinarius is drawn out and elongated, and its orifice, from being so high up, is concealed behind the border of the symphysis pubis, thereby rendering the introduction of an instrument very difficult. The urethral canal is more curved than usual, and the curvature is sometimes so great that the male catheter can more readily be used; because the bladder being strongly pushed forwards, and above the pubis, by the developed uterus, draws this canal upwards, and causes it to be applied against the posterior face of the pubic symphysis, thus producing a curvature of the urethra having its concavity in front. Lastly, as the upper part of this canal is compressed by the enlarged womb, the circulation in its inferior parts is impeded, and the whole tube becomes greatly tumefied. It is placed behind the osseous projection produced by the posterior part of the articular surfaces of the pubis, and these two superposed eminences form a considerable tumor in the

---

[1] This discoloration is evidently owing to the greater activity of the circulation in the genital organs, and consequently it ought to be met with in all cases predisposing to a vascular congestion of the genito-urinary apparatus. Mr. Montgomery has detected it in a female at the menstrual period, and it is a well-known fact, that cattle-breeders ascertain whether an animal is in heat or not, by examining the orifice and internal surface of the vagina, which is almost as black as ink under such circumstances.

[2] The hypertrophy of the vessels of the vagina and of the vulva sometimes renders wounds of these parts very dangerous. Profuse hemorrhage has been known to occur in consequence of it.

interior of the pelvis. I have frequently known students who were practising the touch, to be unable to explain the remarkable tumefaction encountered by the finger behind the symphysis.

An annoying vesical tenesmus is often produced by the pressure exercised on the body and neck of the bladder, tormenting the female with frequent ineffectual desires to urinate; these demands are always very urgent, and are satisfied by the discharge of a few drops of urine, but are again reproduced with equal intensity some minutes after. Some persons, judging from this frequent micturition, have thought the urinary secretion was augmented.

In certain cases, the swelling of the urethral walls, and possibly also the compression they sustain, produces its complete obliteration and renders catheterism necessary.

M. Velpeau avers, that he has frequently known the bladder, from the fact of its being more compressed above the fundus than below it during the last fortnight of pregnancy, to project into the upper part of the vagina so as to form a true vaginal cystocele. I think, however, that it is of rare occurrence during pregnancy, since I have met with but two instances of it.

4. The pressure of the uterus upon the vascular trunks, which go to or return from the inferior extremities, genital organs, and lower part of the rectum, interrupts the venous and lymphatic circulation in those parts; whence it frequently happens that a considerable œdema of the limbs and sexual organs is produced, as well as the development of some hemorrhoidal tumors.

5. Pregnant women are habitually costive; hence a voluminous tumor is formed at the lateral posterior part of the excavation by the rectum distended with fecal matters. The pressure of the uterus upon the entire mass of the intestines, frequently gives rise to colic and disorders of digestion.

6. The base of the thorax is enlarged and projects in front; the diaphragm is pressed upward by the uterus and intestinal mass, having its concavity increased in consequence; so much so, indeed, as to obstruct respiration, and the circulation in the heart and great vessels.

7. The skin of the abdomen is very much distended, and is marked, especially towards its inferior part, by some streaks of a brown or bluish color, which form parallel curved lines with the convexity towards the pubis and groins. These are very numerous in some women, but in others they scarcely exist; they become paler, but do not disappear altogether after the delivery; sometimes they are continued even to the upper and internal part of the thighs, and not unfrequently involve the skin of the lumbar and gluteal regions.

The muscles and aponeuroses of the abdominal walls become thinner, the recti muscles are removed from each other, and the aponeurotic space which separates them, instead of being a narrow band, as usual, is at least four and a quarter inches wide, on a level with the navel. The umbilical depression, which in the two first months seems deeper, disappears gradually as gestation progresses; the ring becomes distended, and most generally the skin exhibits a protuberance instead of a pit in its place. The eminence is particularly well marked when the female exerts herself, owing to the engagement of a small piece of epiploon in it, constituting a temporary hernia.

Not unfrequently an oblong tumor appears on the median line after delivery, produced by a projection of the bowels in consequence of the great separation of the aponeurotic fibres. The tumor is especially evident during any exertion; and increases in size with each succeeding pregnancy, until it finally becomes an infirmity, which obliges the woman to have recourse to a bandage.

8. The relaxation of the pelvic symphyses is a frequent occurrence; when existing to a great extent, it constitutes a disease that will be more fully detailed in the pathological history of pregnancy.

ARTICLE IV.

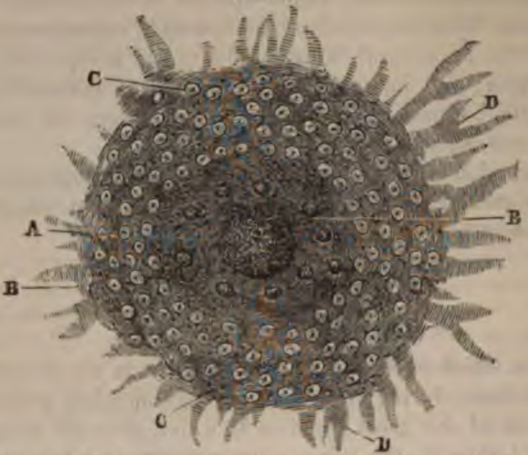
CHANGES IN THE BREASTS.

The *mammæ*, which must also be considered as an appendage to the genital organs, undergo, during gestation, some modifications preparatory to the accomplishment of the great function to which they are destined after the accouchement; thus, in the very commencement, most women find their breasts to become tender and larger, and with some, this is so constant a sign that they do not hesitate to consider themselves pregnant as soon as it is perceptible. The enlargement is frequently attended by certain pricking sensations or positive pains, sometimes even by engorgements of the axillary ganglia. It is by no means uncommon for the swelling to diminish towards the fourth or fifth month, but it reappears again near the end of pregnancy, and is then considerably larger than before. In some women it may even be carried to the extent of producing an inflammatory engorgement of its substance, followed by an abscess. More rarely, the breast, which was at first slightly enlarged, subsides, and remains flaccid and soft until after delivery. In general, this is an unfortunate circumstance, because, from the observations of my friend, Dr. Donné, such women prove very poor nurses on account both of the bad quality and the small quantity of their milk.

[When the swelling of the breasts is very decided, it occasions so great a distention of the skin as to give rise to markings which resemble precisely those described upon the skin of the abdomen.]

About the end of the second month, according to Mr. Montgomery, but in my opinion a little later, the nipple swells, and becomes more erectile, sensitive, and projecting; its color also is deeper. The surrounding skin becomes the seat of a larger afflux of liquid, and assumes an almost emphysematous appearance. This skin is also discolored, exhibiting at first a light yellowish tint, but in the course of the two succeeding months the areola is completed, and the skin of the mamma then presents the following characters: A circle around the nipple, the color of which varies in depth of shade according to the individual, being generally darker in persons who have black hair and eyes, and in brunettes, than in blondes, or in feeble and delicate women. The circle is from three-quarters of an inch to one inch and a quarter in extent, but, like the intensity of the discoloration, it increases with the advancement of gestation. In the negress, the areola likewise becomes darker.

FIG. 49.



[A. Nipple. B. Sebaceous tubercles scattered over the surface of the true areola. C. Spots of the dotted areola. D. Markings due to distention of the skin.]

[Here and there on the surface of the areola we find small elevations of about one-sixteenth to three-sixteenths of an inch, due to an hypertrophied condition of the twelve or twenty sebaceous glands already described. When they are pressed, a whitish fluid escapes which has been mistaken for milk.

Toward the fifth month, another areola, known as the secondary, spotted or dappled areola, is formed around the first one. It extends much farther than the first one, often covering a large portion of the skin of the breasts. When this spotted areola is examined closely, we observe that the pigmentary coloration does not cease suddenly at the circumference of the true areola, but that the coloring matter is so deposited in the adjacent skin as to form a vanishing layer of greater or less extent in different women. This secondary areola is sprinkled with a considerable number of small white spots which give it a peculiar appearance. The spots, which have a rounded form, are merely so many points devoid of pigment, each one exhibiting in its centre a small black spot which marks the orifice of a sebaceous gland and the position of a minute hair discoverable by the assistance of a magnifier.]

These changes usually persist during lactation, though when the woman does not suckle her infant they diminish after delivery, but do not wholly disappear. Consequently, they are more conclusive in primiparæ than in others; and although we must not always anticipate their existence in pregnancy, yet, whenever they are found, they constitute an almost certain sign of that condition. (See *Diagnosis of Pregnancy.*)

ARTICLE V.

[ANATOMICAL AND FUNCTIONAL CHANGES OF PARTS NOT IMMEDIATELY CONNECTED WITH THE GENERATIVE FUNCTION.

The entire organism is deeply affected by the pregnant condition. Of the changes observable some are purely physiological and compatible with excellent health, whilst others are pathological. Although indispositions and diseases so often fall to the lot of the pregnant female, it were an exaggeration to say that pregnancy is a disease of nine months duration. Some women are never better than when pregnant, in which case it is eminently a physiological condition.

Although it is difficult to draw the line between these two orders of phenomena, we have nevertheless endeavored to indicate it as clearly as possible, and in this intent shall study at present only such anatomical and functional changes as are observed in healthy pregnant females, leaving all that is pathological for discussion in another part of the work.

§ 1. DIGESTION. NUTRITION.

The digestive organs are almost always affected by pregnancy; but to those functional changes which are familiar to all, we shall add a description of some anatomical alterations of more recent observation.

Disturbances of Digestion.—Sometimes immediately after impregnation has taken place, the digestive function indicates by unmistakable signs the impression produced upon it thereby. We may adopt Professor Pajot's very natural classification of these changes, namely, *stimulation*, *depression*, *disorder*, and *perversion*.

Stimulation of the digestive function, says this author, is the least frequent of these classes, though it sometimes occurs. The appetite is then greater, digestion easier, the circulation quicker, the face of a fresher color, and the mucous membranes redder.

Depression of the function is much more common, and is indicated by some emaciation, pallor, and alteration of the features. These are often followed by disorder and perversion of digestion, vomiting being the most noticeable phenomenon of all. Although the latter classes are so commonly attendant upon the pregnant condition as sometimes to have a real diagnostic value, they ought nevertheless to be regarded as diseases, and studied as a part of the pathology of gestation.

Fatty Condition of the Liver.—The liver is found to be increased in size in almost all women who die during or shortly after labor. It was this fact which first drew my attention to this organ, and led me to the discovery of the fatty condition described in my inaugural thesis. The following is a brief statement of the facts concerning it. The color of the hepatic tissue is not uniform, its substance being sprinkled with minute yellow spots so numerous as to give it the appearance of granite. The spots also seem to form so many projecting points, of a size varying from that of a pin's head to that of a millet-seed. Sometimes they are disseminated, at others aggregated, forming in the latter case little insular patches, though sometimes the agglomeration is such as to give rise to a yellow spot of an inch or more in diameter. This appearance is not limited to the surface of the liver, but will be found in any section made through the substance of the organ.

A microscopic examination of this tissue, made in connection with Dr. Vulpian, exhibited hepatic cells in good condition mingled with an abundance of fat globules. A fatty condition of the liver in pregnant women is therefore well determined, although its causes and significance are, as yet, but little understood.

§ 2. CIRCULATION.

Throughout the period of pregnancy, but especially during the latter half, the general circulation becomes more active; an activity which modern research has shown to be connected with important changes in the composition of the blood and with hypertrophy of the heart.

Changes in the Blood.—The conditions known as the plethora and hydræmia of pregnant women have been successively admitted by the profession, but as they involve a question to be studied in connection with the diseases of pregnancy, we here confine ourselves to the statement, that both opinions, though perhaps exceptionally true, are equally false in the majority of cases. Though the blood be altered during pregnancy, we see no reason for regarding the alteration as anything more than a physiological phenomenon.

To MM. Andral and Gavarret is due the honor of having discovered the changes which the blood undergoes during pregnancy, and their investigations have been followed up by Becquerel, Rodier, and Regnauld. As the experiments of all these observers coincide, we have but to give the results at which they arrived.]

Now, if we admit with MM. Andral and Gavarret, that the mean normal proportion of corpuscles is 127, or with MM. Becquerel and Rodier, that it is 141 for men and 125 for women, it will be seen that all the analyses made up to the present time give a much lower mean for a woman at an advanced stage of her pregnancy. Thus, of 34 bleedings examined by Andral and Gavarret, but one specimen exhibited, at the end of the second month, a proportion of corpuscles greater than the physiological mean, namely, 145. In one only, pregnant between one and two months, did the corpuscles reach the physiological standard of 128. In all the remaining 32 cases the corpuscles were below this point, ranging in 6 cases from 125 to 120, and in the other 26, from 120 to 95.

The 34 bleedings gave different results as regards the fibrin, the mean physiological proportion of which is 3, according to the period of pregnancy at which the blood was drawn. Thus, from the first month to the end of the sixth, the amount of fibrin was always below the average; the mean being 2·5, the minimum 1·9, and the maximum only 2·9. During the last three months, on the contrary, the proportion of fibrin exceeded the physiological average; it was about 4, the maximum reaching 4·8. Toward the end of the last month, the average is 4·3.

MM. Becquerel and Rodier analyzed the blood of nine pregnant women, two of whom were 20 years of age, two 22, one 25, one 27, one 29, one 34, and one 41.

Five of these were of robust constitution, two were about the average in this respect, whilst the other two were weak and apparently lymphatic.

Six enjoyed excellent health, two were not so well, and one was in the hospital on account of indefinite pains in the abdomen, and a cough of rather long standing, though not serious in character.

One was 4 months pregnant, four 5, one 5½, one 6, and two 7.

The following represents the average composition of the blood, at least as regards its principal elements:—

	Average.	Maximum.	Minimum.
Corpuscles,	111·8	127·1	87·7
Fibrin,	3·5	4·	2·5
Albumen,	66·1	68·8	62·4
(The average in non-pregnant women is 70·5.)			
Water,	801·6		
(The average in non-pregnant women is 791·1.)			

My colleague and friend, M. Regnauld, has the following table in his thesis, and I think it so important that I give it entire:—

We would also add with M. Regnauld, that not only is the serum more abundant relatively to the fibrin and corpuscles, but that it contains less solid matter, which of course helps to increase the total amount of water contained in the blood.

[If the blood of a pregnant female be examined by the usual mode of bleeding, a contracted and buffy clot is sometimes obtained, all readily explained by the increase of the fibrin. Still, this appearance is less frequent than has been asserted, and than one might be led to suppose would be the case. Out of nearly two hundred bleedings practised at an advanced period of gestation, M. Jacquemier discovered the buffy coat but once in six, and even then its thickness was very slight. The same author also observed that most of the women whose blood was buffed had fever, and that but few were free from any apparent disease.

The increase of fibrin in pregnant women continues for a certain time after delivery. None of these facts should be forgotten whilst studying puerperal diseases, for without them one would be liable to explain the excess of fibrin by the inflammatory nature of the disease, whilst it is only the expression of a transient physiological condition.

The causes of all of the changes in the blood which we have just studied elude our research. It does not seem to us, however, unreasonable to suppose that the increase of fibrin, by rendering the blood more coagulable, may have a tendency to lessen the hemorrhage which always accompanies delivery. We shall, however, have occasion to revert to this subject.]

Hypertrophy of the Heart.—M. Larcher, long ago (1828), called attention to hypertrophy of the heart as a result of pregnancy; and quite recently, in a paper read at the Academy of Sciences, produced new observations in support of his opinion. According to him, the walls of the left ventricle become at the least one-quarter, and at the most one-third, thicker during the latter months of pregnancy or shortly after delivery; the right ventricle and the auricles preserving their normal thickness. He considers this the cause of the precordial murmur so common during gestation, and the consequence of the obstruction to the flow of blood towards the lower extremities, occasioned by the development of the womb.

[Numerous observations by M. Blot, confirm those of M. Larcher which have just been mentioned. He proved their correctness both by measurement, which is always very difficult, and by weight determined with the greatest care. The results, which he has obligingly put in my possession, are as follows: The total average weight of the heart in 20 cases of puerperal women was about 9 oz. 38 gr. *tr.*, whilst in the usual state the heart of a young woman weighs but from 7 oz. to 7 oz. 2 dr. *tr.* It would thus appear that the organ gains more than one-fifth upon its total weight during pregnancy. This hypertrophy affects the left ventricle almost exclusively, and is remarkable for being temporary like the hypertrophy of the uterus. (H. Blot.)

§ 3. CHANGES IN THE URINE.

The urine undergoes great alteration during pregnancy—so that, beside glycosuria, which will be studied in connection with the phenomena observed after delivery, and albuminuria, which properly belongs to the diseases of pregnancy, we have now to treat of kyesteine whose presence in the urine appears to be a result of the pregnant condition.]

of Paris. The size of the organ was nearly double that of the normal condition. A longitudinal incision was made through its posterior wall, after which it was opened and spread out, so as to exhibit the whole extent of the cavity. The latter was free as in the unimpregnated condition, and contained no fluid. The mucous membrane was, however, much thickened and tumefied, presented numerous irregular folds, and was furnished throughout with a rich network of vessels. Notwithstanding the general hypertrophy of the mucous membrane, a sort of soft tumor was discoverable, situated on the anterior surface of the uterus between the two Fallopian tubes, as though the membrane were thicker there than elsewhere. (See Plate III, Fig. 1.) Upon incising this elevated portion, the ovum was recognized by the villi of its chorion. The internal orifices of the tubes and of the neck were free and permeable as usual.

Another woman was examined at the Morgue, who had committed suicide about the fortieth day of her pregnancy. The uterus, which was much larger than in the preceding case, was incised longitudinally on its anterior surface, and so disposed as to exhibit the greatest possible extent of the internal surface.

As in the foregoing specimen, the mucous membrane, which was very vascular throughout and greatly hypertrophied, was in some points still more puffed up, and furrowed with folds and wrinkles.

The upper two-thirds of the cavity were occupied by a soft, fluctuating tumor, situated upon the posterior surface between the two Fallopian tubes. Externally, this tumor presented altogether the appearance and organization of the mucous membrane lining the remainder of the womb. The lower third of the cavity was free, so that the cavity of the neck could be entered without any obstacle presenting. The openings of the tubes were also permeable. An incision upon the most prominent part of the tumor revealed a cavity inclosing an ovum.

The most superficial examination of these two pieces convinced us: 1. That the internal surface of the uterus is lined by a thick, soft membrane, which presents numerous wrinkles and folds at several points. 2. That the ovum was situated in the upper part of the womb, and apparently lodged in a cavity perfectly distinct from that of the remainder of the organ.

Now, in order to solve the problem which we are investigating, we shall have to ascertain, first, the nature of the membrane which lines the cavity of the uterus, as also of those forming the walls of the pouch which incloses the ovule.

The decidua with its three parts, (parietal, ovular, and intermediate,) is simply the mucous membrane in a state of hypertrophy. 1. When a pregnant uterus is compared with the description given (page 95) of the changes which the organ undergoes at the menstrual period, it will be readily perceived that the internal layers of the uterus present in both cases the same physical properties, the former being, however, more tumefied, vascular, and folded. It will also be seen, especially after the uterus has been immersed in spirits and water, that the numerous small openings are merely the glandular apertures enlarged, which are observable upon the mucous membrane in the unimpregnated condition (page 80). Finally, the demon-

Dr. Kane, who has observed these changes almost hourly, furnishes the following account of their progress: The pellicle appears at a variable period; I have seen it sometimes at the end of thirty-six hours — at others, as late as the eighth day; it is scarcely perceptible at first, but soon a light cloud of a milky or bluish-white appearance is seen at the centre or sides of the glass; at the beginning, in some cases, it is uniformly deposited on the surface, constituting there a transparent layer, which becomes more and more distinct; at other times, it is not so well characterized in the early stages, presenting only a few striated, irregular circular lines, resembling a web, but these striæ become condensed, and about the fifth day are resolved into a true pellicle. It now presents a creamy, opaline layer, of a light-yellow color, which grows thicker and thicker; its external surface is rendered unequal and ragged by the presence of small granulations, which are whiter in color and crystalline. The pellicle then resembles the layer of fat that floats on the surface of cold broth, and it retains these characters for a long time. On the subsequent days, the sides of the glass are covered with small whitish streaks, varying from a line to a fourth of an inch in extent, which attest the descent of the pellicle during the evaporation. The pellicle, especially when thick, gives off a strong cheesy odor, according to Dr. Bird, and thus facilitates the diagnosis; but Dr. Kane has verified this observation in only seven cases out of twenty-five, and he has not remarked that any relation exists between the thickness of the pellicle and the intensity of the odor.

After standing for several days, the pellicle seems first to give way at the centre, and fissures extend, somewhat later, from this point toward the circumference. Gradually, small particles separate from the debris and fall to the bottom of the glass; the pellicle thus diminishes in thickness, but it seldom disappears altogether before the putrefaction of the liquid takes place; and the primary deposit at the bottom is thus increased by all the detached portions of pellicle, which gradually settle down.

The substance forming the pellicle has been denominated *kyesteine* (from κυησις, εως, gestation), by M. Nauche. The globules, held in suspension when the urine is excreted, gradually aggregate, mount to the surface, and constitute the pellicle above described. This pellicle rarely fails to develop itself in the urine of pregnant women; thus, for instance, in eighty-five cases examined by Dr. Kane, it appeared in sixty-eight with all its characteristics, in eleven it was not well marked, and in six only it failed to appear. One of the last six had a mammary abscess, and was convalescent from typhoid fever; another was very much enfeebled by previous hemorrhages, and only four could be regarded as true exceptions to the rule.

Without denying the existence of the modification which we are studying, I cannot accept the opinion of the American accoucheur in regard to the frequency of its occurrence. With the view of determining this point, I have examined the urine of a great number of pregnant females, and I can certify, that, although it did present the characters indicated in a certain number of cases, yet very frequently, and especially in the later months, nothing of the kind was discoverable.

I confess, also, that were I to depend upon the result of my latest investigations, I should be inclined to regard the existence of this pellicle as altogether exceptional in the last six weeks of gestation; for I have examined (September and October, 1849) the urine of fifteen women without observing it. I do not, however, forget that I have, in former years, proved the correctness of the observations of my predecessors, and I am unable to explain this difference in the result of experiments performed in absolutely the same manner. Can it be due, as M. Regnauld supposes, to the preservation of its acidity much longer than usual, instead of becoming alkaline within two, three, or four days, as is customary? I acknowledge that my attention was not directed to this point.

The urine of healthy women who are not pregnant, exhibits nothing similar to this, and if at any time it furnishes a pellicle, it has not the distinctive characters of kyesteine. Some years ago, it was my custom to examine comparatively the urine of non-pregnant females, which I placed in the same kind of vessels, and under the same conditions of temperature and atmospheric exposure; and every time that I met with kyesteine in the urine of pregnancy, that of the other woman presented nothing similar.

In certain pathological conditions, the urine is sometimes covered with a pellicle which might prove a source of error, though some authors have pretended to be able to distinguish it from that which is due to pregnancy. For instance, the pellicle which occasionally forms on the urine of persons laboring under phthisis, articular diseases, vesical catarrh, or a metastatic abscess, does not appear before the fifth or sixth day, that is, at about the period when putrefaction begins, and having once commenced, its development is completed in the course of a few hours; whereas, the true kyesteine appears on the second day, is then developed but very slowly, and apparently quite independent of putrefaction. Again, this latter has a greater specific gravity than that produced by any pathological state whatever.

According to the views of M. Regnauld, which we shall give shortly, it will be seen, that, inasmuch as it is due to the same cause, the pathological pellicle ought to present the same characters, and that writers have been deceived as to the value of the different signs just mentioned.

The chemical characters of kyesteine will serve to distinguish it from all the mucous or albuminous matters found in the urine. These properties, agreeably to M. Eguisier, are nearly all negative; thus, it is neutral, insoluble in alcohol, ether, water, and ammonia, and, unlike albumen, it is not soluble in alkaline fluids, nor, like mucus, in a mixture of soap and ammonia, neither in boiling alcohol and ether like fat. Further, the urine containing it will not coagulate by boiling, as albuminous urine does, but deposits a copious white powder on cooling; nor will it coagulate by the addition of nitric acid.

Kyesteine has, however, many of the properties of these substances; for, being evidently of an organic nature, it is precipitated by the deuto-chloride of mercury, by most strong acids, and the astringent solutions. Finally, in the present state of our knowledge, it must be regarded as a new substance, which is considered by MM. Bonastre and Nauche as gelatino-albuminous. (Eguisier.) We shall find further on, that the researches of M. Regnauld tend to establish the contrary.

Although writers on the subject agree very nearly as to the physical and chemical properties of kyesteine, they differ widely in regard to its microscopical characters. Thus, MM. Eguisier, Golding Bird, Kane, and Donné disagree as to the size, form, and number of the globules. M. Simon, who has very frequently subjected the pellicle to microscopic examination, gives the following as the result of his researches. It is found to contain the following elements: 1, an amorphous matter, formed of small opaque points; 2, numerous vibriones in active motion; 3, crystals of ammoniaco-magnesian phosphate; 4, if the examination be made at a still later period, it will contain an abundance of monads.

The most difficult point of the subject to determine is the following: To what is the presence of kyesteine in the urine of pregnant females to be attributed?

After having endeavored to prove that it could not result from a particular action in the kidney, from the functional derangement of the respiratory apparatus, from any modification whatever in the digestive action, or from the new functions of the mammary glands, M. Eguisier concluded that it must be owing to the passage of the amniotic liquor, or a part of its elements, into the urine, and he thought that the two following propositions (which are more fully detailed in his memoir) proved the correctness of his conclusions in a satisfactory manner, namely:

A. There is a continual exhalation and absorption going on upon the external face of the amnios, the products of which are removed from the organism through the urinary passages.

B. The admixture of a certain quantity of the liquor amnii with the urine of a healthy person, not pregnant, confers upon it many of the properties of kyesteinic urine.

The truth of this proposition being admitted, it readily explains, he says, 1, why the urine only begins to be charged with it at a period when the amniotic liquor is abundant enough for us to suppose that its passage into the urine would be appreciable; 2, why the kyesteinic characters are not so evident at the end of gestation, a period when the liquor amnii is less abundant, or less charged with animal matters; and 3, why they suddenly disappear after the evacuation of the waters.

But Dr. Kane does not admit this explanation, plausible as it seems; for he believes that the kyesteine is intimately associated with the lacteal secretion, and appears to attribute it to an admixture of milk with the urine. "In fact," he continues, "I have frequently proved the presence of kyesteine in the urine, at different periods of lactation, notwithstanding the formal proposition of M. Eguisier; for in forty-four nursing women, out of ninety-four, the perfect kyesteinic pellicle was developed, with all the characters it exhibits during gestation; and it was nearly always in those cases where the flow of milk is limited, or rendered difficult by some particular circumstance, and in which the breasts were consequently more or less engorged, that kyesteine appeared in the urine; but it was found much more rarely whenever the mother nursed her infant, and her breasts were properly drawn. In a word," says Dr. Kane, "the existence of kyesteine during pregnancy, and even after the accouchement, up to the establishment of the mammary secretion; its rare existence during lactation, and its reappearance, when the latter is suspended or impeded, at the time of weaning, for instance, establish an intimate relation between the functions of the mammæ and the kyesteinic urine." Golding Bird, Simon, and Lehman entertain nearly similar views.

An attentive study of the facts pertaining to this subject has led my colleague and friend, M. Regnauld, to the following opinion:

Normal urine holds in solution a certain amount of azotized matter, originating, probably, in an incomplete combustion of albuminous substances, which in the blood are transformed into uric acid, or, by a higher degree of oxygenation, into urea.

Now we may readily assure ourselves, that during pregnancy there is a hyper-secretion by the kidney of an analogous, if not of an identical matter; and it is to the action of the air upon this azotized matter in its abnormal proportions, that the several phenomena before described appear to be due.

The first cloudiness of the fluid is due to the separation of carbonate of lime, formed by the reciprocal reaction of the carbonate of ammonia, resulting from the decomposition of the urea, and of the phosphate of lime which already existed in the urine. In proportion as the decomposition giving rise to ammonia progresses, the fluid loses its acidity, until the brilliant crystals of ammoniaco-magnesian phosphate, which are so readily recognized by microscopic examination, begin to appear upon its surface.

It is singular, that whilst these reactions are going on, such a multitude of microscopic animalcules (vibriones) should be developed in the urine as to cause the whitish layer, when examined with a proper magnifying power, to seem composed entirely of them, in connection with crystals of ammoniaco-magnesian phosphate.

In order to prove that the formation of the pellicle of which we are speaking is really due to the action of the oxygen of the air upon one of the elements of the urine, it will only be necessary to observe what takes place in two equal quantities of the same urine, one of which is exposed to the air, whilst the other is removed from its influence by being placed in an atmosphere of hydrogen, of carbonic oxide, &c. The first will present the characters described, whilst the other will exhibit no such phenomena.

M. Regnauld does not regard these properties of the urine as due to a special matter contained in it, but as a consequence of the presence of an over-proportion of an element which is common to all urine; whence it seems reasonable to suppose, that this excess of azotized matter might exist under other circumstances, and then give rise to the same phenomena.

The period at which the kyesteine appears in the urine of pregnant women, is stated by writers to be exceedingly variable. M. Eguisier says that the characters which we have described usually begin to show themselves in the course of the second month, and acquire their greatest development from the third to the sixth month; after the seventh, they generally decline until the end of gestation, so that in the course of the ninth, and sometimes even of the eighth month, they are hardly more marked than in the second. M. Tanchou has observed them in women who had missed of Paris. The size of the organ was nearly double that of the normal condition. A longitudinal incision was made through its posterior wall, after which it was opened and spread out, so as to exhibit the whole extent of the cavity. The latter was free as in the unimpregnated condition, and contained no fluid. The mucous membrane was, however, much thickened and tumefied, presented numerous irregular folds, and was furnished throughout with a rich network of vessels. Notwithstanding the general hypertrophy of the mucous membrane, a sort of soft tumor was discoverable, situated on the anterior surface of the uterus between the two Fallopian tubes, as though the membrane were thicker there than elsewhere. (See Plate III, Fig. 1.) Upon incising this elevated portion, the ovum was recognized by the villi of its chorion. The internal orifices of the tubes and of the neck were free and permeable as usual.

Another woman was examined at the Morgue, who had committed suicide about the fortieth day of her pregnancy. The uterus, which was much larger than in the preceding case, was incised longitudinally on its anterior surface, and so disposed as to exhibit the greatest possible extent of the internal surface.

As in the foregoing specimen, the mucous membrane, which was very vascular throughout and greatly hypertrophied, was in some points still more puffed up, and furrowed with folds and wrinkles.

The upper two-thirds of the cavity were occupied by a soft, fluctuating tumor, situated upon the posterior surface between the two Fallopian tubes. Externally, this tumor presented altogether the appearance and organization of the mucous membrane lining the remainder of the womb. The lower third of the cavity was free, so that the cavity of the neck could be entered without any obstacle presenting. The openings of the tubes were also permeable. An incision upon the most prominent part of the tumor revealed a cavity inclosing an ovum.

The most superficial examination of these two pieces convinced us: 1. That the internal surface of the uterus is lined by a thick, soft membrane, which presents numerous wrinkles and folds at several points. 2. That the ovum was situated in the upper part of the womb, and apparently lodged in a cavity perfectly distinct from that of the remainder of the organ.

Now, in order to solve the problem which we are investigating, we shall have to ascertain, first, the nature of the membrane which lines the cavity of the uterus, as also of those forming the walls of the pouch which incloses the ovule.

The decidua with its three parts, (parietal, ovular, and intermediate,) is simply the mucous membrane in a state of hypertrophy. 1. When a pregnant uterus is compared with the description given (page 95) of the changes which the organ undergoes at the menstrual period, it will be readily perceived that the internal layers of the uterus present in both cases the same physical properties, the former being, however, more tumefied, vascular, and folded. It will also be seen, especially after the uterus has been immersed in spirits and water, that the numerous small openings are merely the glandular apertures enlarged, which are observable upon the mucous membrane in the unimpregnated condition (page 80). Finally, the demon-

uterine surface has the same color, the same thickness, the same profuse supply of vessels, and is perforated in like manner with numerous glandular orifices. Its ovular surface presents at the same period irregular cavities or lacunæ of variable depth, resembling precisely those described as belonging to the inter-utero-placental layer, and which are penetrated in like manner by the villi of the portion of the chorion covering the ovum. (See Pl. III., Figs. 2 and 3.) But as the ovum enlarges, it elevates and extends it, until about the end of the first month, when commencing atrophy is observed at its centre, in consequence of which its vessels and glands disappear, and the whole of this portion of the membrane gradually loses its thickness. (See Pl. III., Fig. 1.) The result is, that, either in consequence of the distention which it undergoes, or of the pressure exerted upon its most prominent portion through the growth of the ovum, a small but gradually enlarging circular space, deprived of vessels, appears in its centre, whilst the remainder of the surface presents the same vascularity as the parietal mucous membrane. This central portion becomes very thin, even at periods when the circumference of the membrane preserves a considerable thickness.

The obliteration of the vessels and the atrophy of the glandules progress from the centre towards the circumference, so that by the third month the epichorial membrane differs so materially from the parietal mucous membrane that, except at the parts adjacent to the points where the two become continuous, the glandular orifices and vessels are no longer discoverable.

The lacunæ described as existing upon the ovular surface, are still further effaced by the atrophy, and as the villi of the chorion, which were inserted into them, can no longer derive thence the means of nutrition, they become useless and atrophied in like manner.

As the development of the ovum progresses, it tends naturally to encroach upon the cavity of the womb, and consequently to bring the epichorion and the uterine mucous membrane nearer together, until, at the end of the third month, the two are in contact. At a rather later period, they become so adherent as to be separated with difficulty.

It is hardly necessary to state, that when thus deprived of its vascular elements, the ovular portion of the membrane can no longer accommodate itself to the distention produced by the ovum, otherwise than by a progressive thinning of the membrane, and that its extreme delicacy in advanced ovums, or at maturity, is to be thus accounted for. It is found, however, even after labor, adhering either to the chorion or to the parietal mucous membrane.

c. The *uterine* or *parietal decidua* retains the characters already described until towards the end of the second month; but from this time it begins to grow thinner, and its numerous and deep folds are gradually effaced. This first period of degeneration progresses, however, very slowly, for at the third month, the state of the membrane is very nearly the same as at the menstrual periods. (Richard. *Thesis.*)

[Together with this atrophy begins also a transformation of the epithelium, which gradually passes from the cylindric to the tessellated form. There is no proof, however, that the prismatic cells assume directly the pavimentous form;

indeed Robin says that, on the contrary, some time after fecundation takes place, the epithelium of the cavity of the body of the uterus exfoliates, as it were, cell by cell, or at the most by little shreds, and is replaced by the pavimentous form.

This metamorphosis of the epithelium is true for both the uterine and ovular decidua, and when the two come in contact, we have, as a result of their adherence, a layer of epithelial cells in the very substance of the membrane. So intimate, indeed, is the adhesion between the so-called uterine and reflected portions of the decidua, that at the time of delivery they seem to form but a single layer.]

From the fourth month, the uterine decidua begins to lose the marks of energetic vitality which had characterized it hitherto, and its external appearance (perforation and vascularity) is altered; it becomes atrophied to such an extent as to be reduced by the seventh month to the one-twenty-fifth of an inch in thickness, and is still thinner at the termination of pregnancy. Though inseparable at the outset from the subjacent tissue, it is now, in a measure, an independent membrane, and may be isolated and detached in strips of considerable size. This ready separation is due, according to M. Robin, to the commencing development, near the end of the fourth month, between it and the muscular tissue of a new membrane, which is at first soft, downy, and homogeneous, the first trace, in fact, of the mucous membrane which is to replace the decidua that falls after labor. It thickens gradually during the latter half of gestation, and lines the internal surface of the uterus, whose muscular fibres are not therefore left exposed by the complete decollation and expulsion of the uterine decidua, which takes place after labor.

[*Of the Decidua at the end of Gestation.*—At the end of gestation the decidua is thin, and of a grayish or rose-colored appearance; it has an areolar texture, and an irregular surface. The outermost of its two surfaces is throughout in relation with the internal walls of the uterus, now covered by the first elements of the newly forming mucous membrane. Its internal surface adheres closely to the chorion, and at the point of insertion of the placenta becomes involved in the structure of the uterine surface of that organ. (See *Placenta.*)

When the after-birth is delivered, a rupture takes place between the mucous membrane of the body of the uterus and that of the neck. The latter remains, whilst that of the body, now the decidua, is expelled with the ovum, of which it forms the exterior envelope.

It is soft and easily torn; and although the vessels which traversed it whilst it adhered to the uterus, are for the most part obliterated and atrophied, some of them may yet be found full of blood. By scraping with the nail, it may be removed in little shreds. Its softness and opacity serve to distinguish it from the other envelopes of the ovum, which are stronger and transparent.

The inter-utero-placental mucous membrane is duplicated, so to speak, by being separated into two layers: the thinner is removed with the placenta, into the formation of which it enters (maternal placenta, see *Placenta*); the thicker remains adherent to the uterus, and is soon blended with the newly formed mucous membrane of the adjacent parts. The inter-utero-placental mucous membrane does not, therefore, entirely fall away; no newly formed mucous membrane is to be found beneath it, so that it cannot be properly called a *decidua*.

If, therefore, we consider the whole uterine mucous membrane at the time of delivery, we find that the portion lining the neck is not detached, and that the greater part of the inter-utero-placental portion remains adherent and assists in the formation of the new membrane. (See *Phenomena appertaining to the lying-in*

usually becomes fixed upon the fundus near the middle of the interval between the orifices of the two tubes.

Now, notwithstanding its minuteness, it is impossible that the ovum should not depress the softened tissue with which it is in contact, and it soon excavates, so to speak, a cell in their substance.

As the ovule increases in size, the swelling of the mucous membrane also progresses, especially at the point where the former is arrested. As a consequence of this simultaneous development, the depression produced by the ovule in the substance of the mucous membrane becomes deeper, and it is gradually buried, first one-quarter of it, then one-half, until at last it is almost completely hidden and inclosed. (Richard, *Extract from the Lessons of M. Coste.*) In proportion as it becomes more deeply buried, the edges of the cavity excavated by it seem to grow up around it, at first to the level of the most projecting portion, and then approach each other, so as gradually to contract the opening by which a communication is maintained with the remainder of the uterine cavity. The borders of the opening draw still nearer, and finally circumscribe a minute orifice, the trace of which remains for a short time only in the form of a central depression or *umbilicus*. The umbilicus itself at last disappears, and from this time the ovum is completely imprisoned in a sort of cyst, whose walls are composed exclusively of the mucous membrane.

Whatever may be thought of this theory, we find in the uterus, five or six weeks after conception, an entirely free space, the ovum occupying but a portion of the cavity, and a greatly hypertrophied mucous membrane, which at the point where the ovum is fixed, seems to fold upon itself in order to embrace the latter. We have now to ascertain what becomes of the uterine mucous membrane during gestation, as also of the two layers produced by its folding.

EXPLANATION OF PLATE III.

FIG. 1. Uterus at the twentieth or twenty-fifth day of gestation. Half the natural size.

c, *c*. Mucous membrane of the uterus, with its rich vascularization.

c'. The portion of mucous membrane which covers the ovum.

x. The small circular space around which the vessels disappear, and whose centre presents the appearance of a recently closed umbilicus.

u, *u*. Muscular structure of the uterus, exhibiting, upon the cut surface, a multitude of venous sinuses in various degrees of development.

m, *m*. Muscular portion of the neck, distinguished from that of the body by the absence of venous sinuses.

l. Vaginal portion of the neck.

l'. A gland of Naboth, greatly distended.

q, *q*. The ovaries. On the one to the right is a highly developed corpus luteum, *g*; its surface is very vascular, and on its apex is perceived, *g'*, the cicatrix of the opening through which the ovule escaped.

t, *t*. Fallopian tubes.

p, *p*. Fimbriated extremities of the tubes.

FIG. 2. Is the same specimen as the preceding, except that a circular incision has been made in the portion of mucous membrane upon which the ovum is situated, and the flap turned back, so as to exhibit its deep or ovular surface.

According to this view, the decidua serotina and the primitive decidua have a common origin and texture, and only differ as regards the time of their formation.

In adding, finally, that the decidua was by some supposed to be destitute of vessels (anhistous membrane of Velpeau), whilst others considered it to be perforated and traversed by arteries and veins in considerable number, we shall have briefly reviewed the most generally received opinions upon this subject.

With the exception of some disagreement in regard to unimportant details, all authors were unanimous as respects this capital fact, namely, that the decidua is a newly-formed membrane superadded to the uterine mucous membrane, from which, however, it is entirely distinct. So evident, indeed, did this fact appear, that no one, notwithstanding the old assertions of Sabatier, Mayer, Seiler, and Weber, could bring himself to admit that the decidua was only a development of the lining membrane of the uterus. And even at the present time, notwithstanding the numerous preparations of M. Coste (1842), who was the first to sustain the truth of this proposition in France, many honest minds still hold to the theory of Hunter, which I myself supported so long.

In the second edition of this work, after having stated the opinions which have been successively advanced, respecting the origin, nature, and mode of development of the decidua, I said: "I have examined, with M. Coste, several of the preparations on which he relies for the support of his view, that the decidua is nothing else than the uterine mucous membrane itself, which is hypertrophied by the progress of gestation; unfortunately the ovum in all of them had advanced to the third month at least, and it seems to me that the question can only be determined when an opportunity shall be afforded of examining an ovum of not more than five or six weeks. I am, therefore, far from having a settled conviction, though I am willing to confess that the last uterus examined by us together, has singularly shaken my belief on this point of ovology; and this, conjoined with the descriptions given by Weber and Sharpey, restrains me from speaking with the same degree of confidence as formerly. I therefore think it a question requiring further examination." (Page 176, trans. of 2d edition.)

My desires expressed in 1844 have been realized; and, thanks to the kindness of M. Coste, I have had the opportunity of examining an admirable collection of specimens of all ages, which, I take the opportunity of acknowledging, have not left the remotest doubt in my mind, at least as regards the principal fact. I therefore reject the more or less ingenious hypotheses proposed hitherto,—hypotheses which, it is true, were rendered very probable by the examination of a large number of ova expelled by abortion,—and with the sincerest conviction of its truth adopt the opinion, that the decidua is nothing else than the hypertrophied mucous membrane. The evidence of anatomical demonstration is not, however, to be resisted, and I doubt not that all who, like myself, shall have studied the beautiful preparations at the College of France, will be convinced of the error of their views. For the benefit of those who may not have the good fortune to see these preparations, I think it proper to give further on the description and the figure borrowed from the magnificent atlas which he is publishing.

Present Theory of the Decidua.—The history of the decidua is, at the present time, merely a continuation of the account of those modifications of the uterine mucous membrane, the study of which was begun whilst treating of menstruation. They are, in fact, so intimately connected, that, in order to understand what remains to be said on the subject, it is necessary to recall the condition of the mucous membrane of the uterus at the menstrual period.

Whilst the evolution of the ovarian vesicle is going on in the ovary, the vascularity of the uterine mucous membrane is, as we have stated (p. 95), greatly increased; and the highly congested vessels are discoverable beneath the epithelium. The utricular glands also become visibly enlarged. By this development of its principal elements, the mucous membrane is so thickened, that in consequence of its restriction to the small cavity of the uterus, it is thrown into folds and circumvolutions of variable depth, which are especially well marked at the angles, and give forth secondary ramifications from the sides, so as to occasion some uniformity of appearance. This state of turgescence, and the violet hue which often accompanies it, is maintained, in a greater or less degree, until the ovule is discharged; it diminishes during the last days of the menstrual period, and disappears almost entirely some time after the catamenia have ceased.

But if the ovule, before leaving the ovarian vesicle, or during its passage through the tube towards the cavity of the womb, receive the vivifying influence of the spermatic fluid, the fecundation will maintain and increase the abnormal excitement of the genital organs, produced by the simple development of the Graafian vesicle. Then, instead of subsiding, the uterine mucous membrane becomes still more turgescent, and of a deeper violet color, and the folds and wrinkles increase so as to more than fill the cavity of the organ. Its vessels are engorged and distended to such a degree as to cause small effusions, which are perceptible beneath the epithelium, and also to produce ecchymosis, which give to the internal surface of the uterus a striking marbled appearance.

Notwithstanding this great turgescence, the internal surface of the mucous membrane is smooth and polished, and never presents the villous projections described by Baër, neither is there any fluid secreted, nor any trace of a newly-formed false membrane. The orifices of the glandular tubes, which are much more visible than in the unimpregnated condition, are alone seen upon the surface.

For a short time after it has entered the womb, the ovule is free from all adhesions, but soon becomes permanently fixed at the point where it was arrested at the outset. Before studying the means by which at a later period it becomes adherent to a circumscribed portion of the uterine parietes, let us examine the facts, and see what can be learned respecting the youngest ovules which it has been possible to observe up to the present moment.

In the beautiful Atlas of M. Coste, is figured and described the uterus of a young primiparous woman, who committed suicide about the twentieth or twenty-first day of her pregnancy, and whose body was opened at the Morgue

indeed Robin says that, on the contrary, some time after fecundation takes place, the epithelium of the cavity of the body of the uterus exfoliates, as it were, cell by cell, or at the most by little shreds, and is replaced by the pavimentous form.

This metamorphosis of the epithelium is true for both the uterine and ovular decidua, and when the two come in contact, we have, as a result of their adherence, a layer of epithelial cells in the very substance of the membrane. So intimate, indeed, is the adhesion between the so-called uterine and reflected portions of the decidua, that at the time of delivery they seem to form but a single layer.]

From the fourth month, the uterine decidua begins to lose the marks of energetic vitality which had characterized it hitherto, and its external appearance (perforation and vascularity) is altered; it becomes atrophied to such an extent as to be reduced by the seventh month to the one-twenty-fifth of an inch in thickness, and is still thinner at the termination of pregnancy. Though inseparable at the outset from the subjacent tissue, it is now, in a measure, an independent membrane, and may be isolated and detached in strips of considerable size. This ready separation is due, according to M. Robin, to the commencing development, near the end of the fourth month, between it and the muscular tissue of a new membrane, which is at first soft, downy, and homogeneous, the first trace, in fact, of the mucous membrane which is to replace the decidua that falls after labor. It thickens gradually during the latter half of gestation, and lines the internal surface of the uterus, whose muscular fibres are not therefore left exposed by the complete decollation and expulsion of the uterine decidua, which takes place after labor.

[*Of the Decidua at the end of Gestation.*—At the end of gestation the decidua is thin, and of a grayish or rose-colored appearance; it has an areolar texture, and an irregular surface. The outermost of its two surfaces is throughout in relation with the internal walls of the uterus, now covered by the first elements of the newly forming mucous membrane. Its internal surface adheres closely to the chorion, and at the point of insertion of the placenta becomes involved in the structure of the uterine surface of that organ. (See *Placenta.*)

When the after-birth is delivered, a rupture takes place between the mucous membrane of the body of the uterus and that of the neck. The latter remains, whilst that of the body, now the decidua, is expelled with the ovum, of which it forms the exterior envelope.

It is soft and easily torn; and although the vessels which traversed it whilst it adhered to the uterus, are for the most part obliterated and atrophied, some of them may yet be found full of blood. By scraping with the nail, it may be removed in little shreds. Its softness and opacity serve to distinguish it from the other envelopes of the ovum, which are stronger and transparent.

The inter-utero-placental mucous membrane is duplicated, so to speak, by being separated into two layers: the thinner is removed with the placenta, into the formation of which it enters (maternal placenta, see *Placenta*); the thicker remains adherent to the uterus, and is soon blended with the newly formed mucous membrane of the adjacent parts. The inter-utero-placental mucous membrane does not, therefore, entirely fall away; no newly formed mucous membrane is to be found beneath it, so that it cannot be properly called a *decidua.*

If, therefore, we consider the whole uterine mucous membrane at the time of delivery, we find that the portion lining the neck is not detached, and that the greater part of the inter-utero-placental portion remains adherent and assists in the formation of the new membrane. (See *Phenomena appertaining to the lying-in*

stration is completed by the researches of M. Robin, showing that this membrane, like that of the unimpregnated uterus, is composed of the same anatomical elements, that is to say: 1, of embryo-plastic elements; 2, of laminated fibres, both in the embryonic state or that of fibro-plastic bodies, and in that of fully developed filaments; 3, of special cells; 4, of an amorphous matter; 5, of glands; 6, of vessels; 7, that it is covered with cylinder-epithelium becoming tessellated during gestation. All these elements are, to be sure, in a hypertrophied and changed condition, but inasmuch as M. Robin has followed their changes step by step, there can be no doubt as to their identity.

2. The ovum is inclosed in a distinct cavity, separated from that of the uterus by a membranous partition, which has to be incised in order to expose it. This is the membrane hitherto described as the *decidua reflexa;* now what is it? It presents, throughout, the characters of the uterine mucous membrane; it has the same physiognomy, the same arrangement, the same vascularity, and the same glandular orifices; only there is upon its most prominent portion a small circular space, around which the vessels disappear. This space, which is whiter, or of a lighter rose color than the remainder, is the largest in the most advanced ovum. The membrane is distinctly continuous with the uterine mucous membrane at its base, and the vessels traversing it are absolutely the same with those which ramify in the latter. Finally, microscopic investigations leave no doubt that the structure of the two membranes is identical. With the same physical qualities, continuity of tissue, and identity of structure, the membrane surrounding the ovum, the *decidua reflexa* of authors, can be nothing else than a portion of the mucous membrane of the uterus.

3. If the ovum be removed from the cavity which inclosed it, the bottom of the latter is found to be lined by a membrane which is thickly sown with anfractuosities or irregular lacunæ of various sizes, in which those villi of the chorion were engaged which subsequently form the placenta. It is the portion of the mucous membrane to which the fecundated ovule adhered at the outset, and is consequently continuous with that covering the parietes, and identical in regard to structure.

Therefore, the ovule, which upon entering the womb lies free in the cavity, becomes, after the lapse of a period as yet unascertained, enveloped by and lodged in a sort of fold of the mucous membrane.

The manner in which this inclusion of the ovule is effected is a subject of hypothesis; for, although the ovule has been observed when free, at the outset, as also when completely enveloped after the third week of gestation, observations are wanting for the intermediate period. Therefore, in the absence of direct information, we give the explanation proposed by M. Coste, and, indeed, it is difficult to conceive how the phenomenon could take place otherwise.

After traversing the Fallopian tube, the ovum escapes from its internal orifice, and falls into the cavity of the uterus. On account of the swelling of the mucous membrane, this cavity is almost obliterated, and the ovule is consequently supported between two opposite points of the hypertrophied and softened membrane. Therefore, it rarely progresses very far, and

usually becomes fixed upon the fundus near the middle of the interval between the orifices of the two tubes.

Now, notwithstanding its minuteness, it is impossible that the ovum should not depress the softened tissue with which it is in contact, and it soon excavates, so to speak, a cell in their substance.

As the ovule increases in size, the swelling of the mucous membrane also progresses, especially at the point where the former is arrested. As a consequence of this simultaneous development, the depression produced by the ovule in the substance of the mucous membrane becomes deeper, and it is gradually buried, first one-quarter of it, then one-half, until at last it is almost completely hidden and inclosed. (Richard, *Extract from the Lessons of M. Coste.*) In proportion as it becomes more deeply buried, the edges of the cavity excavated by it seem to grow up around it, at first to the level of the most projecting portion, and then approach each other, so as gradually to contract the opening by which a communication is maintained with the remainder of the uterine cavity. The borders of the opening draw still nearer, and finally circumscribe a minute orifice, the trace of which remains for a short time only in the form of a central depression or *umbilicus.* The umbilicus itself at last disappears, and from this time the ovum is completely imprisoned in a sort of cyst, whose walls are composed exclusively of the mucous membrane.

Whatever may be thought of this theory, we find in the uterus, five or six weeks after conception, an entirely free space, the ovum occupying but a portion of the cavity, and a greatly hypertrophied mucous membrane, which at the point where the ovum is fixed, seems to fold upon itself in order to embrace the latter. We have now to ascertain what becomes of the uterine mucous membrane during gestation, as also of the two layers produced by its folding.

EXPLANATION OF PLATE III.

FIG. 1. Uterus at the twentieth or twenty-fifth day of gestation. Half the natural size.

c, c. Mucous membrane of the uterus, with its rich vascularization.

c′. The portion of mucous membrane which covers the ovum.

x. The small circular space around which the vessels disappear, and whose centre presents the appearance of a recently closed umbilicus.

u, u. Muscular structure of the uterus, exhibiting, upon the cut surface, a multitude of venous sinuses in various degrees of development.

m, m. Muscular portion of the neck, distinguished from that of the body by the absence of venous sinuses.

l. Vaginal portion of the neck.

l′. A gland of Naboth, greatly distended.

q, q. The ovaries. On the one to the right is a highly developed corpus luteum, *g;* its surface is very vascular, and on its apex is perceived, *g′*, the cicatrix of the opening through which the ovule escaped.

t, t. Fallopian tubes.

p, p. Fimbriated extremities of the tubes.

FIG. 2. Is the same specimen as the preceding, except that a circular incision has been made in the portion of mucous membrane upon which the ovum is situated, and the flap turned back, so as to exhibit its deep or ovular surface.

h. Section of the mucous membrane covering the ovum, exhibiting its thickness relatively to that which lines the remaining portion of the womb.

c''. Internal surface of the flap of the uterine mucous membrane (decidua reflexa) which covered the ovum.

a. The ovum, with its surface thickly set with short but considerably branched villi, which come into direct contact with the maternal blood.

FIG. 3. The uterine mucous membrane of the specimen represented by Fig. 1, divided on a level with the neck, and seen separately. The blood which distended its vessels having escaped, in consequence of its immersion in spirits and water, the vascular network which it exhibited has disappeared, and permits us to see that its entire surface is perforated with minute openings, which are the glandular apparatus, observable upon the mucous membrane of the uterus in the unimpregnated condition. The portion of mucous membrane beneath which the ovum was situated, is incised as in the preceding figure, but the ovum is here removed, so as to exhibit completely the walls of the cavity which contained it.

f. The cell or cavity which contained the ovum, strewn with anfractuosities and irregular lacunæ, in which the villi of the chorion were inserted.

c''. Internal surface of the flap of mucous membrane which covered the ovum. The same lacunæ are observable in it as on the opposite surface, *f*, but they are smaller, less numerous, and less pronounced.

s. Sections of the venous sinuses of the mucous membrane of the uterus.

t', t'. Internal orifice of the Fallopian tubes, rendered visible in the preparation by the greater unfolding of the mucous membrane. There is no indication of their ever having been obliterated.

Description of the Three Portions of the Decidua.—From the foregoing account, it appears that the different portions of the decidua are the result of the successive phases of development of the uterine mucous membrane, and in order to follow with greater ease the metamorphosis of the latter, we shall describe consecutively the three portions of the decidua.

A. *The Intermediate or Utero-epichorial Membrane.*—If, after the removal of the ovum, the cavity which it occupied be examined during the first month, or the first half of the second, a multitude of irregular grooves or lacunæ, of variable size and depth, in which the villi of the chorion were engaged (see Pl. III., Fig. 3), will be perceived upon the mucous membrane which forms its bottom. These lacunæ, into which smaller ones enter, and which are so numerous as to give to this portion of the membrane the appearance of an areolar, erectile tissue, are supposed by M. Coste to be produced by the wearing away, or corrosion of the vessels, which are more hypertrophied at this point than elsewhere, by the invading growth of the chorion; so that the lacunæ, by communicating directly in this way with the subjacent uterine sinuses, permit the maternal blood to flow into the cavity occupied by the ovum, and come into direct contact with the villi of the chorion.

The presence of the ovum determines at this point a considerable hypertrophy of all the elements of the mucous membrane. The corresponding villi of the chorion also become greatly developed, and all together constitute at a rather later period the mass of the placenta. (See *Placenta.*)

B. The *ovular decidua* or *epichorial membrane* presents very different appearances according to the period at which it is examined. Shortly after its formation is completed, that is to say, after the umbilicus is obliterated, it differs in no respect from the parietal mucous membrane: its

uterine surface has the same color, the same thickness, the same profuse supply of vessels, and is perforated in like manner with numerous glandular orifices. Its ovular surface presents at the same period irregular cavities or lacunæ of variable depth, resembling precisely those described as belonging to the inter-utero-placental layer, and which are penetrated in like manner by the villi of the portion of the chorion covering the ovum. (See Pl. III., Figs. 2 and 3.) But as the ovum enlarges, it elevates and extends it, until about the end of the first month, when commencing atrophy is observed at its centre, in consequence of which its vessels and glands disappear, and the whole of this portion of the membrane gradually loses its thickness. (See Pl. III., Fig. 1.) The result is, that, either in consequence of the distention which it undergoes, or of the pressure exerted upon its most prominent portion through the growth of the ovum, a small but gradually enlarging circular space, deprived of vessels, appears in its centre, whilst the remainder of the surface presents the same vascularity as the parietal mucous membrane. This central portion becomes very thin, even at periods when the circumference of the membrane preserves a considerable thickness.

The obliteration of the vessels and the atrophy of the glandules progress from the centre towards the circumference, so that by the third month the epichorial membrane differs so materially from the parietal mucous membrane that, except at the parts adjacent to the points where the two become continuous, the glandular orifices and vessels are no longer discoverable.

The lacunæ described as existing upon the ovular surface, are still further effaced by the atrophy, and as the villi of the chorion, which were inserted into them, can no longer derive thence the means of nutrition, they become useless and atrophied in like manner.

As the development of the ovum progresses, it tends naturally to encroach upon the cavity of the womb, and consequently to bring the epichorion and the uterine mucous membrane nearer together, until, at the end of the third month, the two are in contact. At a rather later period, they become so adherent as to be separated with difficulty.

It is hardly necessary to state, that when thus deprived of its vascular elements, the ovular portion of the membrane can no longer accommodate itself to the distention produced by the ovum, otherwise than by a progressive thinning of the membrane, and that its extreme delicacy in advanced ovums, or at maturity, is to be thus accounted for. It is found, however, even after labor, adhering either to the chorion or to the parietal mucous membrane.

c. The *uterine* or *parietal decidua* retains the characters already described until towards the end of the second month; but from this time it begins to grow thinner, and its numerous and deep folds are gradually effaced. This first period of degeneration progresses, however, very slowly, for at the third month, the state of the membrane is very nearly the same as at the menstrual periods. (Richard. *Thesis.*)

[Together with this atrophy begins also a transformation of the epithelium, which gradually passes from the cylindric to the tessellated form. There is no proof, however, that the prismatic cells assume directly the pavimentous form;

indeed Robin says that, on the contrary, some time after fecundation takes place, the epithelium of the cavity of the body of the uterus exfoliates, as it were, cell by cell, or at the most by little shreds, and is replaced by the pavimentous form.

This metamorphosis of the epithelium is true for both the uterine and ovular decidua, and when the two come in contact, we have, as a result of their adherence, a layer of epithelial cells in the very substance of the membrane. So intimate, indeed, is the adhesion between the so-called uterine and reflected portions of the decidua, that at the time of delivery they seem to form but a single layer.]

From the fourth month, the uterine decidua begins to lose the marks of energetic vitality which had characterized it hitherto, and its external appearance (perforation and vascularity) is altered; it becomes atrophied to such an extent as to be reduced by the seventh month to the one-twenty-fifth of an inch in thickness, and is still thinner at the termination of pregnancy. Though inseparable at the outset from the subjacent tissue, it is now, in a measure, an independent membrane, and may be isolated and detached in strips of considerable size. This ready separation is due, according to M. Robin, to the commencing development, near the end of the fourth month, between it and the muscular tissue of a new membrane, which is at first soft, downy, and homogeneous, the first trace, in fact, of the mucous membrane which is to replace the decidua that falls after labor. It thickens gradually during the latter half of gestation, and lines the internal surface of the uterus, whose muscular fibres are not therefore left exposed by the complete decollation and expulsion of the uterine decidua, which takes place after labor.

[*Of the Decidua at the end of Gestation.*—At the end of gestation the decidua is thin, and of a grayish or rose-colored appearance; it has an areolar texture, and an irregular surface. The outermost of its two surfaces is throughout in relation with the internal walls of the uterus, now covered by the first elements of the newly forming mucous membrane. Its internal surface adheres closely to the chorion, and at the point of insertion of the placenta becomes involved in the structure of the uterine surface of that organ. (See *Placenta.*)

When the after-birth is delivered, a rupture takes place between the mucous membrane of the body of the uterus and that of the neck. The latter remains, whilst that of the body, now the decidua, is expelled with the ovum, of which it forms the exterior envelope.

It is soft and easily torn; and although the vessels which traversed it whilst it adhered to the uterus, are for the most part obliterated and atrophied, some of them may yet be found full of blood. By scraping with the nail, it may be removed in little shreds. Its softness and opacity serve to distinguish it from the other envelopes of the ovum, which are stronger and transparent.

The inter-utero-placental mucous membrane is duplicated, so to speak, by being separated into two layers: the thinner is removed with the placenta, into the formation of which it enters (maternal placenta, see *Placenta*); the thicker remains adherent to the uterus, and is soon blended with the newly formed mucous membrane of the adjacent parts. The inter-utero-placental mucous membrane does not, therefore, entirely fall away; no newly formed mucous membrane is to be found beneath it, so that it cannot be properly called a *decidua.*

If, therefore, we consider the whole uterine mucous membrane at the time of delivery, we find that the portion lining the neck is not detached, and that the greater part of the inter-utero-placental portion remains adherent and assists in the formation of the new membrane. (See *Phenomena appertaining to the lying-in*

state.) The parietal and ovular mucous membrane constitutes the only portion which is wholly expelled and which really deserves the name of *Decidua.*]

From the details into which we have entered, it is evident:

1. That, excepting the membranes proper of the ovum, the *amnion* and *chorion*, the uterus contains none other than its own mucous membrane.

2. That at the moment when the ovule enters the cavity of the uterus, this membrane has throughout a thickness equal to, if not greater than, that which it possesses at the menstrual period.

3. That this abnormal thickness is wholly due to the hypertrophy of its constituent elements, and especially of peculiar cells, as proved by M. Robin.

4. That immediately after the arrival of the ovule, the vitality of the uterus seems to be concentrated, in a great measure, at that point of the mucous membrane where the ovule is arrested.

5. That, as a consequence of this concentration of the vital forces, the point mentioned of the mucous membrane becomes thickened, grows up around the ovule, investing it with a circular ring, which soon incloses it completely.

6. That from this moment the ovule is separated from the uterine tissue by the *intermediate mucous membrane*, and from the remainder of the uterine cavity by the *ovular mucous membrane.*

7. That, after the first month, the ovular mucous membrane becomes atrophied from the centre towards the circumference, loses its vascularity and glandular openings.

8. That this atrophy involves that of the corresponding villi of the chorion, whilst those which are in relation with the intermediate mucous membrane become, like the latter, considerably developed, and subsequently form the placenta.

9. That, from the fourth month, the parietal mucous membrane begins to degenerate, growing gradually thinner, in consequence of the diminution of its tissue, and of the obliteration by atrophy of its vessels and glands.

10. Finally, that a new mucous membrane is formed by which the old one is removed farther and farther from the muscular tissue to which it adhered so closely at the outset, and that after labor it is completely detached and expelled with the ovum.

This exfoliation of the mucous membrane of the uterus after parturition is explained, to a certain extent, by the formation of a new mucous membrane; but it is much more difficult to understand how it should occur in abortions during the early months, when the adhesion between the mucous and muscular tissues is so very firm. It is true, that the exfoliated decidua is much thinner than that which may be observed still adhering to the uterus at the same period, and that we may suppose a part only of the parietal membrane to have been detached.

CHAPTER IV.

OF THE HUMAN OVUM AFTER FECUNDATION.

THE human ovule, prior to fecundation and at its full maturity, is composed, as previously stated (page 90): 1st. Of the vitelline membrane, or the envelope. 2d. Of a granular liquid contained in this membrane, and called the vitellus (yolk). 3d. Of a little vesicle inclosed in the first, and situated in the midst of the granular liquid. This is the germinal vesicle, originally discovered by Purkinje, in the eggs of birds, and subsequently proved by M. Coste to exist in those of mammalia. 4th, and lastly. Of the germinal or proligerous spot (*macula germinativa*), which is detached from the clear contents of the germinal vesicle, and is held in suspension in the fluid which the latter contains.

If the ovule be examined several weeks after the fecundation has taken place, it will be found to have undergone some very remarkable transformations; for it is then composed of such different parts, that if comparative anatomy had not furnished us opportunities of observing, step by step, and hour by hour, the divers modifications it passes through before the organization is fully completed, we would not believe it to be one and the same product. Thus, at the end of the second or third week after fecundation, it exhibits some very different elements to the observer: for example, we encounter, in passing from without inwards: 1st. The *chorion*, a thick exterior membrane, studded with numerous villosities. 2d. A much thinner membrane, situated more internally, and designated as the *amnios*. 3d. A more or less considerable space between these two envelopes, that is filled by an albuminous liquid, in the midst of which a little vesicle (the umbilical vesicle) is situated. And 4th. A liquid fills the cavity of the amnios, the quantity varying with the period of pregnancy, and in this fluid is the embryo.

Finally, let us add that the ovule is enveloped nearly throughout by a double membrane, which at first is entirely foreign to, but subsequently contracts intimate relations with it; this is the deciduous membrane. But before studying the constituent parts of the ovum at an advanced period of its development, let us see what is their proper commencement, and how they can arise out of the simple elements that form the ovule prior to conception.

When the ovule has attained its full maturity, the vesicle in which it is inclosed becomes the seat of an excitation which determines there a considerable afflux of fluid, and causes its progressive distention. This hypertrophy may, as we have seen, be either spontaneous, or produced by coition or other venereal excitement. As a consequence of the distention, the vessels on that portion of the vesicle which projects the farthest from the surface of the ovary become atrophied, its walls grow thinner, and soon give way, thereby permitting the ovule to escape, which, in passing out, draws along with it a part of its granular cumulus. The ovum then engages in the tube, whose enlarged extremity had been applied to the ovary. It must not be supposed that the period for the ovule's arrival in the tube is invariable in the same species of animals, and it probably varies in the human race also, though nothing positive is known on that point. Pending

usually becomes fixed upon the fundus near the middle of the interval between the orifices of the two tubes.

Now, notwithstanding its minuteness, it is impossible that the ovum should not depress the softened tissue with which it is in contact, and it soon excavates, so to speak, a cell in their substance.

As the ovule increases in size, the swelling of the mucous membrane also progresses, especially at the point where the former is arrested. As a consequence of this simultaneous development, the depression produced by the ovule in the substance of the mucous membrane becomes deeper, and it is gradually buried, first one-quarter of it, then one-half, until at last it is almost completely hidden and inclosed. (Richard, *Extract from the Lessons of M. Coste.*) In proportion as it becomes more deeply buried, the edges of the cavity excavated by it seem to grow up around it, at first to the level of the most projecting portion, and then approach each other, so as gradually to contract the opening by which a communication is maintained with the remainder of the uterine cavity. The borders of the opening draw still nearer, and finally circumscribe a minute orifice, the trace of which remains for a short time only in the form of a central depression or *umbilicus*. The umbilicus itself at last disappears, and from this time the ovum is completely imprisoned in a sort of cyst, whose walls are composed exclusively of the mucous membrane.

Whatever may be thought of this theory, we find in the uterus, five or six weeks after conception, an entirely free space, the ovum occupying but a portion of the cavity, and a greatly hypertrophied mucous membrane, which at the point where the ovum is fixed, seems to fold upon itself in order to embrace the latter. We have now to ascertain what becomes of the uterine mucous membrane during gestation, as also of the two layers produced by its folding.

EXPLANATION OF PLATE III.

FIG. 1. Uterus at the twentieth or twenty-fifth day of gestation. Half the natural size.

c, c. Mucous membrane of the uterus, with its rich vascularization.

c'. The portion of mucous membrane which covers the ovum.

s. The small circular space around which the vessels disappear, and whose centre presents the appearance of a recently closed umbilicus.

u, u. Muscular structure of the uterus, exhibiting, upon the cut surface, a multitude of venous sinuses in various degrees of development.

m, m. Muscular portion of the neck, distinguished from that of the body by the absence of venous sinuses.

l. Vaginal portion of the neck.

l'. A gland of Naboth, greatly distended.

q, q. The ovaries. On the one to the right is a highly developed corpus luteum, *g*: its surface is very vascular, and on its apex is perceived, *g'*, the cicatrix of the opening through which the ovule escaped.

t, t. Fallopian tubes.

p, p. Fimbriated extremities of the tubes.

FIG. 2. Is the same specimen as the preceding, except that a circular incision has been made in the portion of mucous membrane upon which the ovum is situated, and the flap turned back, so as to exhibit its deep or ovular surface.

Pl. III.

Fig. 1

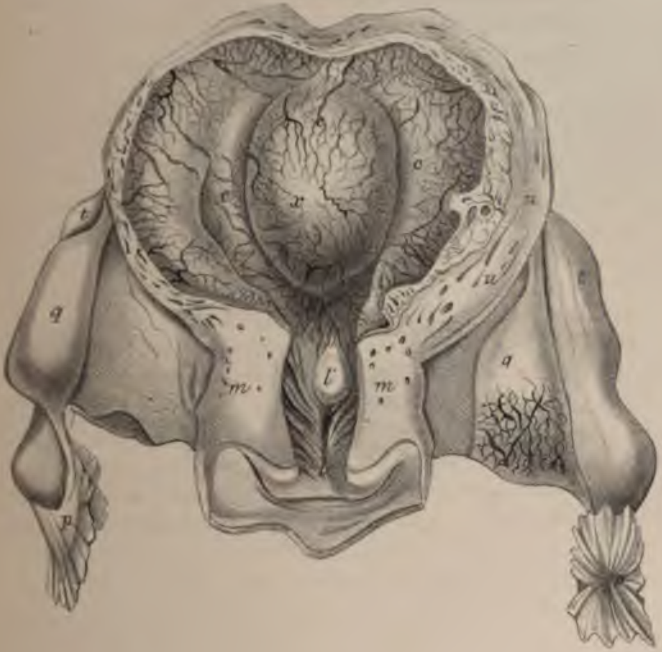


Fig 2

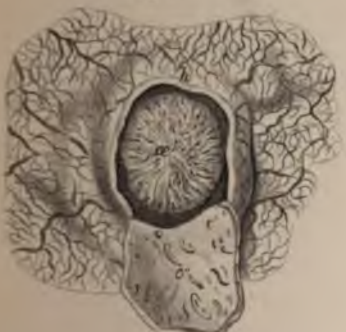
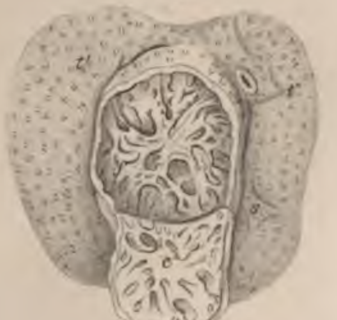


Fig III



T. Sinclair's Lith.

h. Section of the mucous membrane covering the ovum, exhibiting its thickness relatively to that which lines the remaining portion of the womb.

c''. Internal surface of the flap of the uterine mucous membrane (decidua reflexa) which covered the ovum.

a. The ovum, with its surface thickly set with short but considerably branched villi, which come into direct contact with the maternal blood.

FIG. 3. The uterine mucous membrane of the specimen represented by Fig. 1, divided on a level with the neck, and seen separately. The blood which distended its vessels having escaped, in consequence of its immersion in spirits and water, the vascular network which it exhibited has disappeared, and permits us to see that its entire surface is perforated with minute openings, which are the glandular apparatus, observable upon the mucous membrane of the uterus in the unimpregnated condition. The portion of mucous membrane beneath which the ovum was situated, is incised as in the preceding figure, but the ovum is here removed, so as to exhibit completely the walls of the cavity which contained it.

f. The cell or cavity which contained the ovum, strewn with anfractuosities and irregular lacunæ, in which the villi of the chorion were inserted.

c''. Internal surface of the flap of mucous membrane which covered the ovum. The same lacunæ are observable in it as on the opposite surface, *f*, but they are smaller, less numerous, and less pronounced.

s. Sections of the venous sinuses of the mucous membrane of the uterus.

t', t'. Internal orifice of the Fallopian tubes, rendered visible in the preparation by the greater unfolding of the mucous membrane. There is no indication of their ever having been obliterated.

Description of the Three Portions of the Decidua.—From the foregoing account, it appears that the different portions of the decidua are the result of the successive phases of development of the uterine mucous membrane, and in order to follow with greater ease the metamorphosis of the latter, we shall describe consecutively the three portions of the decidua.

A. *The Intermediate or Utero-epichorial Membrane.*—If, after the removal of the ovum, the cavity which it occupied be examined during the first month, or the first half of the second, a multitude of irregular grooves or lacunæ, of variable size and depth, in which the villi of the chorion were engaged (see Pl. III., Fig. 3), will be perceived upon the mucous membrane which forms its bottom. These lacunæ, into which smaller ones enter, and which are so numerous as to give to this portion of the membrane the appearance of an areolar, erectile tissue, are supposed by M. Coste to be produced by the wearing away, or corrosion of the vessels, which are more hypertrophied at this point than elsewhere, by the invading growth of the chorion; so that the lacunæ, by communicating directly in this way with the subjacent uterine sinuses, permit the maternal blood to flow into the cavity occupied by the ovum, and come into direct contact with the villi of the chorion.

The presence of the ovum determines at this point a considerable hypertrophy of all the elements of the mucous membrane. The corresponding villi of the chorion also become greatly developed, and all together constitute at a rather later period the mass of the placenta. (See *Placenta.*)

B. The *ovular decidua* or *epichorial membrane* presents very different appearances according to the period at which it is examined. Shortly after its formation is completed, that is to say, after the umbilicus is obliterated, it differs in no respect from the parietal mucous membrane: its

uterine surface has the same color, the same thickness, the same profuse supply of vessels, and is perforated in like manner with numerous glandular orifices. Its ovular surface presents at the same period irregular cavities or lacunæ of variable depth, resembling precisely those described as belonging to the inter-utero-placental layer, and which are penetrated in like manner by the villi of the portion of the chorion covering the ovum. (See Pl. III., Figs. 2 and 3.) But as the ovum enlarges, it elevates and extends it, until about the end of the first month, when commencing atrophy is observed at its centre, in consequence of which its vessels and glands disappear, and the whole of this portion of the membrane gradually loses its thickness. (See Pl. III., Fig. 1.) The result is, that, either in consequence of the distention which it undergoes, or of the pressure exerted upon its most prominent portion through the growth of the ovum, a small but gradually enlarging circular space, deprived of vessels, appears in its centre, whilst the remainder of the surface presents the same vascularity as the parietal mucous membrane. This central portion becomes very thin, even at periods when the circumference of the membrane preserves a considerable thickness.

The obliteration of the vessels and the atrophy of the glandules progress from the centre towards the circumference, so that by the third month the epichorial membrane differs so materially from the parietal mucous membrane that, except at the parts adjacent to the points where the two become continuous, the glandular orifices and vessels are no longer discoverable.

The lacunæ described as existing upon the ovular surface, are still further effaced by the atrophy, and as the villi of the chorion, which were inserted into them, can no longer derive thence the means of nutrition, they become useless and atrophied in like manner.

As the development of the ovum progresses, it tends naturally to encroach upon the cavity of the womb, and consequently to bring the epichorion and the uterine mucous membrane nearer together, until, at the end of the third month, the two are in contact. At a rather later period, they become so adherent as to be separated with difficulty.

It is hardly necessary to state, that when thus deprived of its vascular elements, the ovular portion of the membrane can no longer accommodate itself to the distention produced by the ovum, otherwise than by a progressive thinning of the membrané, and that its extreme delicacy in advanced ovums, or at maturity, is to be thus accounted for. It is found, however, even after labor, adhering either to the chorion or to the parietal mucous membrane.

c. The *uterine* or *parietal decidua* retains the characters already described until towards the end of the second month; but from this time it begins to grow thinner, and its numerous and deep folds are gradually effaced. This first period of degeneration progresses, however, very slowly, for at the third month, the state of the membrane is very nearly the same as at the menstrual periods. (Richard. *Thesis.*)

[Together with this atrophy begins also a transformation of the epithelium, which gradually passes from the cylindric to the tessellated form. There is no proof, however, that the prismatic cells assume directly the pavimentous form;

indeed Robin says that, on the contrary, some time after fecundation takes place, the epithelium of the cavity of the body of the uterus exfoliates, as it were, cell by cell, or at the most by little shreds, and is replaced by the pavimentous form.

This metamorphosis of the epithelium is true for both the uterine and ovular decidua, and when the two come in contact, we have, as a result of their adherence, a layer of epithelial cells in the very substance of the membrane. So intimate, indeed, is the adhesion between the so-called uterine and reflected portions of the decidua, that at the time of delivery they seem to form but a single layer.]

From the fourth month, the uterine decidua begins to lose the marks of energetic vitality which had characterized it hitherto, and its external appearance (perforation and vascularity) is altered; it becomes atrophied to such an extent as to be reduced by the seventh month to the one-twenty-fifth of an inch in thickness, and is still thinner at the termination of pregnancy. Though inseparable at the outset from the subjacent tissue, it is now, in a measure, an independent membrane, and may be isolated and detached in strips of considerable size. This ready separation is due, according to M. Robin, to the commencing development, near the end of the fourth month, between it and the muscular tissue of a new membrane, which is at first soft, downy, and homogeneous, the first trace, in fact, of the mucous membrane which is to replace the decidua that falls after labor. It thickens gradually during the latter half of gestation, and lines the internal surface of the uterus, whose muscular fibres are not therefore left exposed by the complete decollation and expulsion of the uterine decidua, which takes place after labor.

[*Of the Decidua at the end of Gestation.*—At the end of gestation the decidua is thin, and of a grayish or rose-colored appearance; it has an areolar texture, and an irregular surface. The outermost of its two surfaces is throughout in relation with the internal walls of the uterus, now covered by the first elements of the newly forming mucous membrane. Its internal surface adheres closely to the chorion, and at the point of insertion of the placenta becomes involved in the structure of the uterine surface of that organ. (See *Placenta.*)

When the after-birth is delivered, a rupture takes place between the mucous membrane of the body of the uterus and that of the neck. The latter remains, whilst that of the body, now the decidua, is expelled with the ovum, of which it forms the exterior envelope.

It is soft and easily torn; and although the vessels which traversed it whilst it adhered to the uterus, are for the most part obliterated and atrophied, some of them may yet be found full of blood. By scraping with the nail, it may be removed in little shreds. Its softness and opacity serve to distinguish it from the other envelopes of the ovum, which are stronger and transparent.

The inter-utero-placental mucous membrane is duplicated, so to speak, by being separated into two layers: the thinner is removed with the placenta, into the formation of which it enters (maternal placenta, see *Placenta*); the thicker remains adherent to the uterus, and is soon blended with the newly formed mucous membrane of the adjacent parts. The inter-utero-placental mucous membrane does not, therefore, entirely fall away; no newly formed mucous membrane is to be found beneath it, so that it cannot be properly called a *decidua.*

If, therefore, we consider the whole uterine mucous membrane at the time of delivery, we find that the portion lining the neck is not detached, and that the greater part of the inter-utero-placental portion remains adherent and assists in the formation of the new membrane. (See *Phenomena appertaining to the lying-in*

state.) The parietal and ovular mucous membrane constitutes the only portion which is wholly expelled and which really deserves the name of *Decidua*.]

From the details into which we have entered, it is evident:

1. That, excepting the membranes proper of the ovum, the *amnion* and *chorion*, the uterus contains none other than its own mucous membrane.

2. That at the moment when the ovule enters the cavity of the uterus, this membrane has throughout a thickness equal to, if not greater than, that which it possesses at the menstrual period.

3. That this abnormal thickness is wholly due to the hypertrophy of its constituent elements, and especially of peculiar cells, as proved by M. Robin.

4. That immediately after the arrival of the ovule, the vitality of the uterus seems to be concentrated, in a great measure, at that point of the mucous membrane where the ovule is arrested.

5. That, as a consequence of this concentration of the vital forces, the point mentioned of the mucous membrane becomes thickened, grows up around the ovule, investing it with a circular ring, which soon incloses it completely.

6. That from this moment the ovule is separated from the uterine tissue by the *intermediate mucous membrane*, and from the remainder of the uterine cavity by the *ovular mucous membrane*.

7. That, after the first month, the ovular mucous membrane becomes atrophied from the centre towards the circumference, loses its vascularity and glandular openings.

8. That this atrophy involves that of the corresponding villi of the chorion, whilst those which are in relation with the intermediate mucous membrane become, like the latter, considerably developed, and subsequently form the placenta.

9. That, from the fourth month, the parietal mucous membrane begins to degenerate, growing gradually thinner, in consequence of the diminution of its tissue, and of the obliteration by atrophy of its vessels and glands.

10. Finally, that a new mucous membrane is formed by which the old one is removed farther and farther from the muscular tissue to which it adhered so closely at the outset, and that after labor it is completely detached and expelled with the ovum.

This exfoliation of the mucous membrane of the uterus after parturition is explained, to a certain extent, by the formation of a new mucous membrane; but it is much more difficult to understand how it should occur in abortions during the early months, when the adhesion between the mucous and muscular tissues is so very firm. It is true, that the exfoliated decidua is much thinner than that which may be observed still adhering to the uterus at the same period, and that we may suppose a part only of the parietal membrane to have been detached.

CHAPTER IV.

OF THE HUMAN OVUM AFTER FECUNDATION.

THE human ovule, prior to fecundation and at its full maturity, is composed, as previously stated (page 90): 1st. Of the vitelline membrane, or the envelope. 2d. Of a granular liquid contained in this membrane, and called the vitellus (yolk). 3d. Of a little vesicle inclosed in the first, and situated in the midst of the granular liquid. This is the germinal vesicle, originally discovered by Purkinje, in the eggs of birds, and subsequently proved by M. Coste to exist in those of mammalia. 4th, and lastly. Of the germinal or proligerous spot (*macula germinativa*), which is detached from the clear contents of the germinal vesicle, and is held in suspension in the fluid which the latter contains.

If the ovule be examined several weeks after the fecundation has taken place, it will be found to have undergone some very remarkable transformations; for it is then composed of such different parts, that if comparative anatomy had not furnished us opportunities of observing, step by step, and hour by hour, the divers modifications it passes through before the organization is fully completed, we would not believe it to be one and the same product. Thus, at the end of the second or third week after fecundation, it exhibits some very different elements to the observer: for example, we encounter, in passing from without inwards: 1st. The *chorion*, a thick exterior membrane, studded with numerous villosities. 2d. A much thinner membrane, situated more internally, and designated as the *amnios*. 3d. A more or less considerable space between these two envelopes, that is filled by an albuminous liquid, in the midst of which a little vesicle (the umbilical vesicle) is situated. And 4th. A liquid fills the cavity of the amnios, the quantity varying with the period of pregnancy, and in this fluid is the embryo.

Finally, let us add that the ovule is enveloped nearly throughout by a double membrane, which at first is entirely foreign to, but subsequently contracts intimate relations with it; this is the deciduous membrane. But before studying the constituent parts of the ovum at an advanced period of its development, let us see what is their proper commencement, and how they can arise out of the simple elements that form the ovule prior to conception.

When the ovule has attained its full maturity, the vesicle in which it is inclosed becomes the seat of an excitation which determines there a considerable afflux of fluid, and causes its progressive distention. This hypertrophy may, as we have seen, be either spontaneous, or produced by coition or other venereal excitement. As a consequence of the distention, the vessels on that portion of the vesicle which projects the farthest from the surface of the ovary become atrophied, its walls grow thinner, and soon give way, thereby permitting the ovule to escape, which, in passing out, draws along with it a part of its granular cumulus. The ovum then engages in the tube, whose enlarged extremity had been applied to the ovary. It must not be supposed that the period for the ovule's arrival in the tube is invariable in the same species of animals, and it probably varies in the human race also, though nothing positive is known on that point. Pending its stay in the ovary, the ovum underwent no appreciable modification; but as soon as it enters the oviduct, the beginning of those changes it must necessarily pass through, in order to give birth to a new being, is observed; and hence, to study these modifications in due course, we must first examine those manifested in the tube, and then such as do not appear until after its arrival in the uterine cavity.

ARTICLE I.

CHANGES OF THE OVUM IN THE TUBE.

It has heretofore been always impossible to study these changes in the human ovum, and the description we are about to give is the result of observations made on the ova of mammalia, especially of the dog and rabbit; but analogy favors the belief that similar phenomena take place in the human species; indeed, the strongest resemblance exists between the ovum of the latter, and the unfecundated ovum of a bitch; besides, the youngest ova that have been studied in the female, exactly resemble those which have arrived at a certain degree of development in animals. It is, therefore, extremely probable that if they are endowed with the same organization before conception, and still exhibit a perfect resemblance after the fecundation, they must have passed through similar successive transformations. From analogy as well as observation, it is supposed that in the human female ten or twelve days are occupied in the passage of the ovum through the tube.

[*Disappearance of the Germinal Vesicle.* — By the time the ovum has reached the oviduct, it has become impossible to find in it either vesicle or germinal spot; and this disappearance of the vesicle and of the collection of granules at its centre, constitutes the first change perceptible in the ovum subsequent to its departure from the ovary.

The disappearance shows that the ovum is mature, but occurs independently of fecundation.

Condensation of the Vitellus. — During the early part of its passage through the tube, the vitellus becomes more dense (Bischoff) and compact, in consequence of which it no longer fills the vitelline membrane, but leaves an intervening space occupied by a clear and transparent fluid. So great is this condensation, that if its envelope be opened, the vitellus is found to be a solid body, capable of division by means of a very fine needle into two, four, and six portions. (See Bischoff's *Atlas.*)

Appearance of Polar Globules. — Succeeding the disappearance of the germinal vesicle and during the condensation of the vitellus, there is formed on the surface of the latter a transparent globule, $\frac{1}{500}$ of an inch in diameter, to which the name *polar globule* has been given. From the point of its formation and during the time of its appearance, there is a retrocession of the granules of the vitellus and consequent separation from the hyaline and transparent substance which united them. It would thus seem that the polar globule is produced by a sort of exudation or accumulation of the hyaline substance of the vitellus, and the point at which it is formed indicates where will take place the first furrow of segmentation, and where at a later period the cephalic extremity of the embryo will make its appearance.

Within a few minutes after it is first perceived, the polar globule constitutes a hemispherical projection on the surface of the vitellus, and finally separates from, and remains simply contiguous to it.

In some species of animals, two, three, or four polar globules are thus successively produced, all taking their origin from the same point. When the last of them is formed, all unite to form a single one, which soon exhibits distinctly an investing membrane and a cavity.

The polar globule thus produced remains beneath the vitelline membrane and unconnected with the phenomena which are to take place in its vicinity. It becomes useless, in fact, as soon as formed, being intended only to prepare the way for the segmentation of the vitellus, which we are soon to study.

Whether fecundation has occurred or not, the germinal vesicle disappears, the vitellus condenses, and the polar globules form; but the changes which we are next to study take place only in fecundated ova. (Memoirs of Prof. Ch. Robin.)

Formation of the Vitelline Nucleus and Segmentation of the Vitellus.—Both the layer of albumen which surrounds the fecundated ovum, and the vitelline membrane become thicker during the passage through the second half and internal third of the Fallopian tube; but the most remarkable changes take place in the vitellus (Barry, Bischoff, Robin).

Whilst the vitellus is undergoing its condensation, a clear spot appears in its centre and increases so rapidly in size by crowding aside the vitelline globules, that in about one hour it has attained a diameter of from $\frac{1}{625}$ of an inch to the $\frac{1}{416}$ of an inch (Robin). The spot is called the *vitelline nucleus*, and has nothing in common with either the germinal vesicle or the polar globule. It is composed of a thick fluid without a cavity or distinct walls.

The vitelline nucleus has barely attained the above-mentioned diameters before it is seen to become elongated and constricted near the middle, and finally separates into two halves. This separation is the signal for the segmentation of the vitellus which itself divides into two halves, in the centres of which are found the corresponding halves of the vitelline nucleus.

FIG. 52.

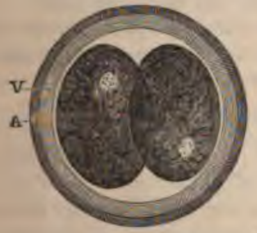
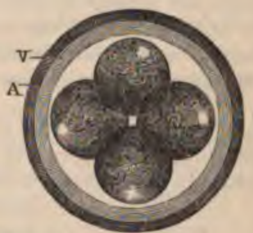


FIG. 53.

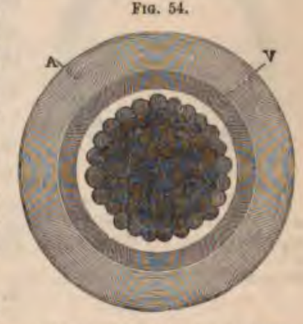


A. The layer of albumen. V. The vitelline membrane.

Each half of the vitellus divides in its turn into two parts and so successively, until by the process of subdivision the entire vitellus (which at first presented two regularly rounded portions (Fig. 52), then four (Fig. 53), and then eight, &c., the vitelline spheres becoming more numerous and smaller) acquires the appearance of a mulberry; whence is derived the name muriform body (Fig. 54) applied to the vitellus after the segmentation is completed.

The segmentation of the vitellus would seem to be dependent upon the segmentation of the vitelline nucleus, a portion of which is found in the centre of each vitelline sphere.]

FIG. 54.



The Fecundated Ovum at a more advanced stage.

A. The albuminous layer surrounding the vitelline membrane V, which is seen to be thickened and to contain within its cavity the mulberry-like mass.

The time necessary for the ovum to traverse the tube is very variable in different animals, and even sometimes in the same species; thus, according to M. Coste, the ovum of rabbits does not reach the uterus before the third or the fourth day, whilst in the bitch, it has been found in the tubes as late as the tenth, twelfth, or even fifteenth day; and we have formerly stated that, in the human species, no one case has ever proved its existence in the womb prior to the twelfth day. However, it is well to remark, that, as a general rule, the passage is very rapid through the external half of the tube, whilst its progress through the second half and especially through the last third is exceedingly slow, in consequence perhaps of the extreme narrowness of this portion of it.

Finally, the ovum augments somewhat in volume during its course, being probably nourished at first at the expense of the granulations which accompany it, and subsequently by absorbing the albuminous liquid secreted in the oviduct itself.[1]

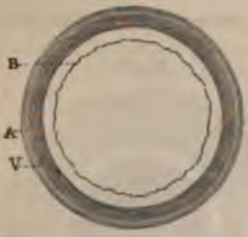
ARTICLE II.

MODIFICATIONS OF THE OVULE FROM ITS FIRST ARRIVAL IN THE WOMB UNTIL AFTER THE DEVELOPMENT OF THE ALLANTOIS.

[*Formation of the Blastodermic Membrane.*—At the time of its entrance into the cavity of the uterus, the ovum is, therefore, composed of the muriform body, the thickened vitelline membrane, and a thin layer of albumen surrounding the latter. Each little sphere of the muriform body now undergoes an internal change by which its outer portion is transformed into a membrane, so that each segmentary sphere represents a cell with a homogeneous envelope and granular tissue. Shortly after this, fluid collects in the centre of the muriform body and presses to the circumference the spheres or cells of which the body had been composed. In consequence of this pressure the cells become flattened and applied to the vitelline membrane so as to form a sort of lining thereto, and by their mutual adherence form a second membrane enclosed within the primary one.]

This second membrane is not easily recognized; but if the example of M. Coste be followed, and the ovule be placed in water, it will become quite apparent. In fact, a very curious endosmotic phenomenon then takes place; the water passing through the vitelline membrane detaches the second vesicle in such a manner that the latter, being completely isolated, has also puckered and corrugated in every direction, floats or hangs suspended in the new liquid which distends the vitelline membrane; and to this M. Coste has given the title of the *blastodermic membrane*. But while this blastodermic vesicle, or membrane, is being developed, the layer of albumen which surrounds the ovum on its first arrival in the uterus, disappears and consequently the vitelline vesicle loses much of its thickness.

FIG. 55.



The ovule shortly after its arrival in the womb. A. The diminished albuminous layer. V. The vitelline membrane. B. The blastodermic membrane.

Hitherto, the ovum still remained free and without any adhesion to the uterine walls; but it commences about this period to contract more intimate relations with the latter, and hence can no longer be displaced by blowing upon it. At the same period a rounded, whitish spot begins to appear on some point of the blastodermic vesicle, which seems to be detached, or to stand in relief; this has been called the *tache embryonnaire* (the embryonic spot) by M. Coste, and it, like the blastodermic vesicle, is composed of cellular granulations, excepting that these latter are more contracted, and are aggregated in a larger quantity at this point. (Figs. 56 and 57.) At the same time, a minute examination is all that is necessary to convince us that the vesicle, as also the embryonic spot, is composed of two laminæ, lying in contact with each other, but which may be separated by a couple of fine needles. To render this doubling of the blastoderm more evident, we present two theoretical figures, exhibiting it at the same stage of development. In the first (Fig. 56), which is a front view of the ovum, the blastoderm with the rounded embryonic spot is seen. The same figure, in profile (Fig. 57), shows the two blastodermic laminæ, both presenting a swelling near the embryonic spot. One has been called the *external*, *serous*, or *animal* layer, and the other is denominated the *internal*, *mucous*, or the *vegetative* one. Shortly after this period, the embryonic spot enlarges by the further addition of granules, but more in one of its diameters than in the others, so as to exchange its rounded for an elongated form.

---

[1] This layer of albumen which surrounds the ovum of the rabbit and of the roebuck, whilst it remains in the tube, does not exist around the ovum of the bitch and of the sow. On account of these differences, it will remain uncertain whether it envelops the human ovum until observations which, as yet, it has been impossible to make, shall settle the question.

FIG. 56.

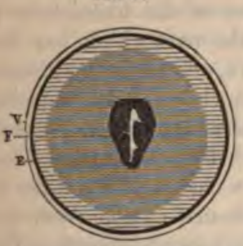


FIG. 57.

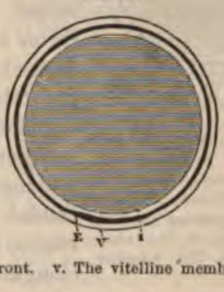


FIG. 56. The blastoderm, with the embryonic spot seen in front. V. The vitelline membrane. E. The external layer of the blastoderm. F. The embryonic spot.

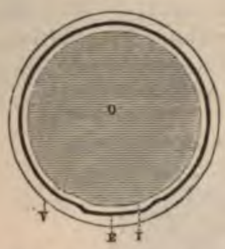
FIG. 57. The same figure in profile, to show the two layers of the blastoderm. V. The vitelline membrane. E. The external; and I, the internal or intestinal layer of the blastoderm.

A considerable projection above the external face of the blastoderm may be simultaneously noticed, which exhibits a convexity towards the vitelline membrane and a concavity looking to the central part of the ovum (Fig. 58); and thenceforth the cavity of the blastodermic vesicle is divided into two distinct portions, the one embryonic, the other, which is the larger, forming the umbilical vesicle.

A line of greater obscurity may soon be recognized at the centre of this spot, being the first trace of the embryo. The margins of this spot fold inwards, as do also the extremities, thereby giving rise to an elongated body curved like a boat with the ends swollen, in consequence of their doubling up, and a cavity of some depth at its centre. The body of the embryo is then readily distinguished.

The extremity that is most swollen is called the cephalic, and the other, or less voluminous one, the caudal extremity; about that time the serous laminæ of the blastoderm can be traced as continuous with the most external layers of the embryonic body, whilst the mucous one forms its internal plane. In proportion as the embryonic spot loses its distinctive characters, numerous little elevations, irregularly scattered over the external surface of the ovum, are seen to develop themselves, being, in fact, the commencement of those villosities which subsequently stud the exterior surface of the chorion.

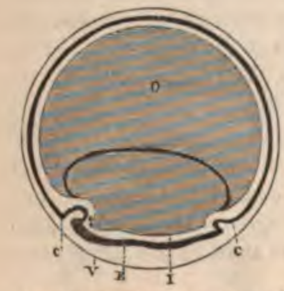
FIG. 58.



A section of a more developed ovum, in which the two portions, the embryonic and the umbilical vesicle, begin to appear. O. The umbilical vesicle. I. The internal layer of the blastoderm. E. The external layer. V. The vitelline membrane.

During the progress of these phenomena, the external, or serous layer of the blastoderm (Fig. 59) forms a fold around the part which has been transformed into the embryo, and curved as already stated; the fold of the serous layer being especially so at the caudal and cephalic extremities. The fold gradually enlarges above, below, and on the sides, in such a manner as to form a true hood over the head and caudal termination; hence named from this resemblance the cephalic and caudal hoods. These folds elongate rapidly (Fig. 60), passing along the dorsal regions of the embryo, and ultimately coming into contact on the median line, unite so as to form a pouch surrounding the embryo, and continuous with it along the whole circumference of its large ventral opening. Although at first almost in direct contact with the embryo, it is soon after separated from it by a certain quantity of liquid, becoming its immediate envelope, and receiving the name of the *amnion*, and the interposed fluid, that of the *amniotic liquor*.

FIG. 59.



A section showing the origin and first traces of the amnios. O. The umbilical vesicle. I. The intestinal; and E, the external layer of the blastoderm. V. The vitelline membrane. C C. Origin of the cephalic and caudal amniotic hoods.

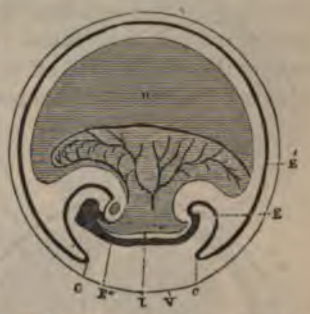
As to the external layer of the fold, it is manifestly continuous with the serous lamina of the blastoderm, and although primarily applied to the preceding, it is speedily separated therefrom by the interposition of a liquid which removes them farther and farther from each other, until at last its exterior face is brought into contact with the vitelline vesicle. According to some authors, these two become confounded, and by uniting form the outer membrane of the ovum; but others teach that the vitelline vesicle will be gradually absorbed (as we have endeavored to represent in the plates Figs. 61, 62, and 63), while the external lamina of the blastoderm is being developed, and the latter alone will then constitute the enveloping membrane.

At the point of junction, the cephalic and caudal hoods constitute, by their union, a kind of membranous bridge, which there joins the amnios to the chorion. This bridge is gradually absorbed, and the two membranes become completely isolated. (See Figs. 61 and 62.)

Such is the view most generally received on the mode of formation of the amnios. We must mention, however, one other, which, without being new, has latterly acquired considerable importance by the discussions which it has created at the Academy of Sciences.

We have just seen that the amnios is directly continuous at the umbilicus with the abdominal walls of the embryo, which is in fact so manifest, that no just ground of belief is afforded that the latter was ever independent of the amnios, as some have recently supposed. Messrs. Oken, Pockels, Serres, and Breschet have endeavored, notwithstanding, to prove that the amnios once existed as an independent vesicle, distended by a fluid; and that afterwards the fœtus, by coming into contact with it, caused its depression, and became enveloped by it, like a double night-cap, but having no other relation with it than that of simple apposition; or, in other words, that the amnios had the same connection with the embryo as the serous membranes with the viscera they cover.

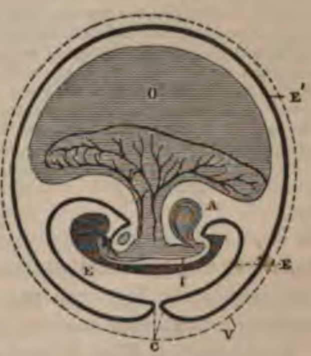
Fig. 60.



The amniotic hoods more developed. O. The umbilical vesicle. I. The internal or intestinal; and E, the external layer of the blastoderm. E′. A portion of the external layer converted into the amnios. E″. The embryo. C. The limit of the amniotic hoods. V. The vitelline membrane.

Messrs. Coste, Velpeau, and Bischoff have combated this view successfully, in my estimation, by contending for the existence, at all periods, of the continuity we have just described, and they cannot possibly admit an opinion which is founded solely on pathological alterations. For my own part, after examining the preparations of M. Coste, I can have no doubt as to the little value of such assertions.

Fig. 61.

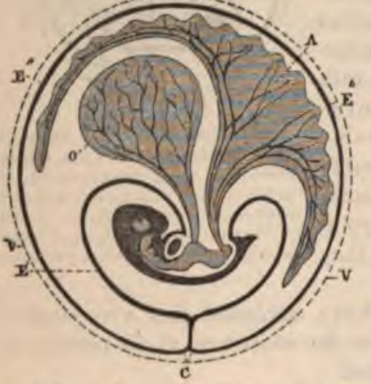


This figure shows the amnios almost completed, and likewise the origin of the allantois. O. The umbilical vesicle. I. The intestines. E. The amnios. E′. The external layer of the blastoderm, or the non-vascular chorion. V. The vitelline membrane. C. The amniotic hoods ready to close up. A. The allantois.

Immediately after the amnios is formed, the margins of the embryonic spot, and especially its true extremities, become more and more turned inwards, thereby augmenting the concavity which it previously exhibited; and at the bottom of the groove thus constituted, the mucous lamina of the blastoderm is observed to concur in forming the intestinal canal, which is represented at this early period by an elongated gutter, communicating freely with the interior cavity of the blastoderm. But, in proportion as this constantly increasing inversion of the lateral walls, and of the extremities of the embryo, progresses, this communication becomes more and more contracted, so that in a short time the intestinal cavity only connects with the blastodermic vesicle by a contracted pedicle; and thenceforth, this latter receives the name of the *umbilical vesicle*, and the vessels which are distributed to its vascular layer, consisting of two veins that enter, and an artery that emerges from the embryo, are called the *omphalo-mesenteric vessels.* (Fig. 61.)

As the contraction of the ventral opening in the embryo, and the circumscription of the umbilical vesicle go on, we may observe at the inferior part of the intestinal canal, just in the region where the bladder and rectum, during the earlier days of embryonic life, are confounded under the name of *cloaca;* we observe, I repeat, the intestinal parietes to form there a slight elevation. Now, this little tumor (Fig. 61) gradually elongates, so as to constitute a minute vesicle, which communicates by its narrow pedicle with the intestinal cavity; this is the *allantois,* which has been known for a long time to exist in mammalia, but which M. Coste was one of the first to detect in the human ovum. The allantois is scarcely formed before it is provided both with venous and arterial vessels, consisting of the two *umbilical arteries,* and one *umbilical* vein; the former arising from the primitive iliacs, the latter going to the liver, as may be seen somewhat later.

FIG. 62.



This figure shows the rapid progress of the allantois, and how it spreads over the fœtus, the umbilical vesicle, and the amnios. This latter begins to ensheathe the pedicle of the umbilical vesicle and that of the allantois in such a way as to form a commencement of the cord. The vitelline membrane disappears more and more. O. The umbilical vesicle. E′. The amnios. E″. The external layer of the blastoderm. C. The point where the two hoods come into contact. V. The vitelline membrane almost entirely atrophied. A. The allantois.

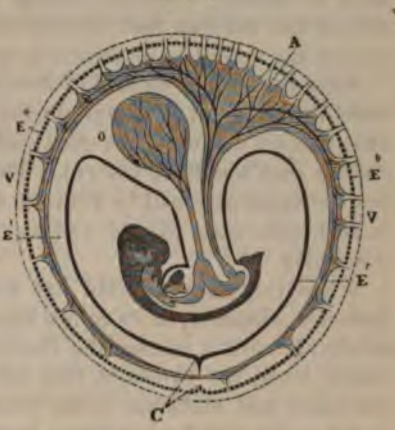
This little vesicle passes through the umbilicus at first alongside of the pedicle belonging to the umbilical vesicle, and soon undergoes a rapid development. The growth of the allantois and its vessels is so rapid that it soon comes into contact with the external membrane of the ovum. In some animals, the allantois comes into juxtaposition by its base with only one point of the chorion, and becomes attached there; and then the terminal extremities of the umbilical vessels not only reach this membrane, but even extend for the most part to the villosities developed on its external surface, and acquire there a considerable growth.

In others (see Figs. 62 and 63), the allantois spreads out like an umbrella around the embryo and umbilical vesicle, and supplies itself to the whole external face of the amnios, as well as to the internal one of the chorion, then the two laminæ are fused into each other in such a way as to leave no trace of the allantois. (Figs. 62 and 63.)

The development of the allantois completes the essential part of the ovum, although by reference to Fig. 55, Plate IV., it will now be found to consist: 1, of the embryo; 2, of a variable quantity of liquid in which it swims; 3, of the amnios, already considerably distended, and forming a sheath to the parts that pass through the ventral aperture; 4, of the umbilical vesicle situated between the amnios and chorion, whose delicate pedicle, with the omphalo-mesenteric vessels appertaining to it, however, still communicate with the intestinal cavity; 5, the pedicle of the allantois vesicle still charged with the umbilical vessels; 6, the space between the amnios and chorion, partly occupied by the umbilical vesicle, but principally filled with a liquid called by M. Velpeau the *reticulated* or the *vitriform body*, according to the degree of its consistence; and 7, of the outer envelope, or the chorion.

The phenomena yet to be studied have special reference to the enlargement of the ovum, and the development of the embryo.

FIG. 63.



In this figure, the allantois has spread over the whole internal surface of the ovum, and but very slight traces are left of the continuity between the amnios and that part of the external layer of the blastoderm which formed the non-vascular chorion; the amnios incloses the umbilical cord more and more. O. The umbilical vesicle. E′. The amnios C. The point where the two hoods are fused into each other, and form but a single membrane. E″. The external layer of the blastoderm. A. The allantois. V. The vitelline membrane.

ARTICLE III.

OF THE FŒTAL APPENDAGES.

These comprise the *allantois*, the *umbilical vesicle*, the *amnion*, and the *chorion*.

§ 1. OF THE ALLANTOID VESICLE.

By the time the amnion has become a completely closed sac, a little pyriform vesicle, which we have denominated the *allantois*, is observed, about the tenth day, to spring from the inferior part of the intestinal canal, and taking on a rapid growth soon becomes applied by its base to the internal surface of the chorion. The terminal branches of the two umbilical arteries and vein, as previously stated, ramify on the walls of this vesicle; and hence the urachus, which is nothing else than the pedicle of the allantois, is accompanied in its course by three blood-vessels (see Fig. 3, Plate IV.), two of which (*i i*) are arterial, coming from the iliacs, and called the *umbilical arteries*. They run to the chorion, where they ramify, and ultimately reach the villi that form the fœtal placenta. The third trunk is venous, and is known as the *umbilical vein*.

The umbilical vein *j* leaves the right auricle of the heart at the point *j′*, and soon after receives the contents of the vena cava inferior *k*; it then traverses the under surface of the liver *m*, to which it sends a copious vascular supply, and, before passing this organ, receives the omphalo-mesenteric vein at the point *o*; then, after leaving the liver, it gains the left side of the abdomen between the walls of this cavity and the intestinal fold E;

next, by turning abruptly towards the umbilical cord, it gets to the left side of the urachus, and accompanies the latter to the chorion, where it follows the umbilical arteries into the villosities.

After the earliest periods of development are over, there is but a single umbilical vein left, although during the first part of the embryonic existence two are met with, one upon each side of the urachus (and consequently one for each umbilical artery). That on the right side becomes effaced, but its traces may still be found at the thirtieth or even the fortieth day; indeed, some such existed and were perceptible on the embryo I am now describing.

When the umbilical vein has actually passed the liver, it gives off no branches whatever, in its course along the urachus, nor does it divide and subdivide until it reaches the chorion. But, in the earlier periods of gestation, when the two exist, they are observed to spread over the walls of the chest and abdomen in the form of a large vascular plexus, extending as far as the vertebral column; however, this new apparatus soon vanishes and leaves no vestige of its former existence.

The body of the allantoid vesicle disappears very rapidly, and scarcely a trace of it can possibly be found after the lapse of a few days from its first appearance. In fact, nothing more is seen than a cord of variable length, extending from the embryo to the chorion, and having the umbilical vessels inclosed within it. This likewise becomes gradually atrophied in such a way as to disappear altogether in the substance of the umbilical cord; nevertheless, a portion of it still persists in the abdominal cavity of the embryo, forming there the cord subsequently known as the urachus; and just as this latter terminates in the rectum, it exhibits a small swelling which is afterwards converted into the urinary bladder. We may remark, in anticipation, that this rudimentary bladder communicates with the rectum, and constitutes there that transitory cloaca, whose existence in the human species may be positively verified by direct observation. It is this early disappearance of the allantois which has induced some ovologists to doubt its existence in the human race. It is exclusively destined to bring the embryonic vessels into contact with the external membrane of the ovum, whence they are soon placed in their proper relation with the internal surface of the womb.

§ 2. Of the Umbilical Vesicle.

This vesicle is formed exclusively by the internal or mucous layer of the blastoderm; at first, it is very voluminous, occupying nearly the whole cavity of the ovum, and communicating so freely with the intestinal cavity as to form with it apparently but a single vesicle. But the gradual contraction of the ventral opening serves to separate the two, as we have already demonstrated, leaving only a pedicle of variable thickness, according to the size of this aperture.

The umbilical vesicle contains a yellowish-white liquid often of a vitelline yellowness, in which numerous granules and fat globules are seen floating. It seems to be formed of two laminæ, between which the vessels are distributed (see Robin, *Journal de Physiologie*, 1861). As the amnion becomes developed, the vesicle is crowded by this membrane, and is then found placed between the external face of the latter and the internal surface of the chorion.

In consequence of the development of the allantois, the umbilical vesicle loses much of its importance in the human species, as it so soon becomes an organ of little value either to the growth of the ovum or the embryo: and furthermore, it dwindles away speedily; thus, during the first three weeks, it is as large as an ordinary pea, but after the fourth, it begins to collapse and diminish in size, and at six weeks subsequent to the conception, it does not exceed a coriander-seed in bulk; then it remains stationary for a time, not disappearing altogether until towards the fourth month. I have observed it several times of later years on ova of three to three and a half months, in which it generally still retained the volume and shape of a small lentil, being of a yellowish color, and having its surface wrinkled. However, I may remark, that its size appeared very variable in several ova of the same age.

In proportion as the umbilical vesicle becomes atrophied, it is removed farther and farther from the trunk of the embryo, in consequence of the development of the amnion, and its pedicle is also elongated in a marked manner; thus, the latter is from two to six lines in length, being continuous at one end with the intestine, and at the other with the vesicle by a kind of an infundibuliform expansion. The pedicle is apparently separated into two portions by the amnios, before the abdominal walls are completely closed up; one part lying between the spine, or rather the intestine, and the spot afterwards occupied by the umbilicus, while the other remains exterior to the abdomen. This pedicle is traversed by a small canal for the first five or six weeks of its existence, and through it the fluid in the vesicle may be pressed back into the intestine, but it is obliterated after that period. About the same time, also, it becomes more and more delicate, and often ruptures from its great elongation; and its umbilical portion being lost in the cord, can no longer be traced into the abdomen. When broken, the vesicle may be found more or less removed from the root of the cord, and lying between the chorion and amnion.

The umbilical vesicle has a rich vascular apparatus, the blood of which is carried to and from the embryo by the intervention of two trunks, one venous, the other arterial; both, however, accompany the pedicle, and form a constituent part of it. The first, N (see Fig. 3, Pl. IV.), called the *omphalo-mesenteric vein*, enters the abdomen, winds around the duodenum, and then opens into the umbilical vein at the point *o*, just as the latter is emerging from the liver. As it passes the duodenum, branches are given off to the stomach and intestines, and when it discharges into the umbilical vein, it sends a voluminous trunk to the liver. That portion which furnishes the branches just described, persists in the adult under the name of the *ventral* or *hepatic-portal vein*, whilst all the rest will disappear with the umbilical vesicle and its pedicle.

The arterial trunk P, accompanying the pedicle, has been designated as the *omphalo-mesenteric artery*. Arising from the aorta, it gains the summit of the intestinal convolution, and gives off branches to the mesentery and to the intestine itself; then it reaches the pedicle, and follows the latter to the umbilical vesicle, upon which it ultimately ramifies. The part that supplies the mesentery is converted in the adult into a mesenteric artery, all the rest being effaced. From all which, it appears that the vascular system of the umbilical vesicle represents the primitive circulation in the embryo, corresponding in it to the sanguiferous apparatus of the yolk of fowls. Of course, these vessels will become atrophied with the organ to which they belong.

The umbilical vesicle seems to be intended to serve as a reservoir for the fluid designed to nourish the fœtus during the first weeks of intra-uterine existence.

§ 3. Of the Amnion.

The most internal membrane of the ovum, or the *amnion*, is formed by the inner lamina of the fold, or the cephalic and caudal hoods which constituted the external serous layer of the blastoderm surrounding the embryo. Being continuous, as we have shown, with the margins of the ventral opening, it seems at first to be attached by its middle part to the skin on the dorsal region.

The internal amniotic surface subsequently exhales a liquid into its cavity, in which the embryo swims freely; hence the amnios constitutes a little sac around the fœtus, having smooth and transparent walls. Its inner surface is bathed by the liquid inclosed in the cavity, whilst its external one is separated from the chorion by a space of variable size, which is likewise filled with a fluid and the expansion of the allantoid vesicle.

Originally, this membrane was not concentric with the chorion; but in proportion as the development advances it presses back the exterior liquid and the allantoid vesicle more and more, thereby condensing it, and finally comes in contact with the external envelope of the ovum. Now, since it adheres to the periphery of the umbilical opening, it must furnish, by such an extension, a sort of membranous sheath to the pedicles of the allantoid and the umbilical vesicles, as well as to their accompanying vessels, surrounding them throughout their course from the umbilicus to the chorion; and all the parts thus inclosed constitute what is called the *umbilical cord;* whence it follows that the abdominal cavity itself must be in connection with the canal represented by this cord, and consequently that the fœtal appendages may communicate with it through the route thus opened to them. It is thus that the pedicle of the umbilical vesicle becomes united to the ileo-cœcal fold of intestine, whilst the allantois connects with the rectum by the intervention of the urachus.

As we have just stated, the amnios is separated from the chorion during the earlier weeks by a filled space, which space is larger in proportion as the ovum is the more recent. This extra-amniotic liquid forms a gelatinous or albuminous mass, of a weblike arrangement, and having the umbilical vesicle in its midst. The mass becomes more and more compact by pressure of the amnion, which has a constant tendency to approach the chorion, thus acquiring the aspect of a membrane (the *membrana media* of Bischoff), which is situated between the chorion and the amnion, where, says this author, it may be readily distinguished towards the end of pregnancy, as a gelatinous, though continuous membrane. M. Velpeau gave it the name of the *vitriform* or *reticulated* body, but Robin has shown its structure to be identical with that of the allantoid vesicle. Velpeau was, therefore, correct in regarding the reticulated body as the analogue of the allantoid, of which it is really but the remains.

The amnion undergoes no important change during the ulterior development of the ovum, nor does its texture. Of course, it would be more firm and consistent, acquiring by time a greater resemblance to the serous membranes, although it neither incloses nor possesses vessels at any period. Nevertheless, says Dugès, it probably has some openings, which permit the waters, exhaled by the uterine capillaries, and received by the vessels of the decidua and the villi of the chorion, to be diffused around the fœtus; but this perspiration of the liquids secreted by the internal uterine surface, may very possibly be a simple phenomenon of endosmosis.

§ 4. Waters of the Amnion.

The amniotic cavity is filled with a liquid, in which the fœtus is immersed. At the commencement of pregnancy, this fluid is of slight density, and more or less transparent and limpid, but towards term it becomes viscid, unctuous, and more consistent than pure water: sometimes it is as clear as serum; at others, it is of a light yellow or greenish color. It frequently becomes lactescent, turbid, and interspersed with yellowish-gray, or even black albuminous flakes; again, in certain cases, it is strongly tinged with yellow, when the membranes are ruptured, from the admixture of a quantity of meconium; it exhales a disagreeable odor, analogous to that of the spermatic fluid, and its taste is slightly saline.

The quantity of the amniotic fluid varies greatly; thus, in the early months it is, relatively to the fœtus, more abundant, in proportion as the embryo is younger. Riolan found four ounces in an ovum containing a fœtus of the size of an ant. The weight of the fœtus and that of the fluid at the middle of gestation, are very nearly equal. Again, dating from this period, the difference is generally in favor of the fœtus, and the weight of the latter at term is four or five times greater than the waters, which seldom exceed a pound or a pound and a quarter; consequently, if the assertion is true, that the waters augment in their absolute quantity until term, it is equally so to say they increase relatively to the fœtus in the first, and diminish in the second half of pregnancy. In fact, the variations in this respect are infinite, even at the time of the accouchement.

According to the analysis of Vauquelin, 100 parts of amniotic liquor consist: of water 98·8; of albumen, hydrochlorate of soda, phosphate of lime, and lime, 1·2. The interesting question now arises: What is the source of the amniotic fluid? Some assert that it comes from the mother; others, that it is produced by the fœtus. Chaussier, Meckel, and Beclard, adopting an intermediate opinion, suppose that its secretion takes place simultaneously from the female and her product.

Everything proves, says M. Velpeau, that the liquor amnii is the result of a transudation or of a simple exhalation, like the serum of the pleura, pericardium, &c., and that this process requires no particular canals for its accomplishment, being a phenomenon of pure vital imbibition.

According to Burdach, the amniotic waters cannot be secreted by the fœtus, because they exist prior to its formation,[1] and therefore they must be exclusively furnished by the internal uterine surface, and reach the cavity of the amnios by traversing its walls. We also believe, that the greater part of this liquid comes from the mother's organs; yet we must add that it also contains certain products, secreted by the fœtus: for instance, it is frequently colored by some meconium, and besides, it is almost certain that the urine may be discharged into the amniotic cavity during the latter months of pregnancy. A few incontestable facts prove that such an evacuation is necessary to the maintenance of fœtal life: thus, Billard and T. W. King record having seen cases of ruptured bladder, resulting from imperforation of the urethra; and further, Desormeaux and P. Dubois have observed an obliteration of this canal in two stillborn children, which had given rise to an enormous distention of the bladder, ureters, and both kidneys; indeed, the latter were found transformed into two multilocular cysts. Similar facts have been presented before the Academy of Medicine by MM. Depaul and Moreau.

According to some authors, the principal use of these waters is to contribute to the nutrition of the fœtus, during at least a great part of gestation. (See *Nutrition of the Fœtus.*) However this may be, the waters of the amnios serve during pregnancy to maintain the insulation of the external fœtal parts before the skin becomes covered with the sebaceous coat hereafter to be described; to promote the active movements of the fœtus and its development, both of which would have been greatly incommoded without this intervention, by the pressure of the uterine walls; to protect the fœtus from all external violence, and to afford it the means of conforming to the laws of gravity. They likewise favor a uniform expansion of the womb, and remove all pressure from the umbilical cord, thus assuring the integrity of the fœto-placental circulation both during pregnancy and labor. In the latter, they seem destined to guard the child from the violence of the uterine contractions, which, without them, would certainly compromise its existence; to aid in forming the amniotic bag, the engagement of which renders the dilatation of the neck more uniform and easy; to lubricate the pelvic canal, and thus facilitate the descent of the fœtus; and lastly, they render manipulations of every kind less difficult than they otherwise would be.

§ 5. OF THE CHORION.

The chorion is the most external envelope of the ovum. Writers are by no means unanimous in their views as to the elements of which it is composed. Thus, some of them, as we have had occasion to state, suppose that it is formed by the vitelline membrane, the external lamina of the blastoderm, and the allantoid vesicle, uniting to constitute a single layer. According to others, on the contrary, the vitelline membrane will disappear soon after the doubling of the blastodermic vesicle, and the external lamina of the latter, conjoined with the allantois, will then form the chorion.

---

[1] It is only necessary to recall our remarks on the development of the amnios to refute this opinion.

[M. Robin's view of the subject is as follows: According to M. Coste, three kinds of chorion appear successively, one of which, however, disappears in consequence of the development of its successor which is substituted for it. The *first chorion*, which lasts for a few days only, is formed by the vegetations which cover the vitelline membrane at the time of the entrance of the ovule into the uterus. No vessels have yet appeared, but they carry nutritive matter from the uterus to the vitellus by endosmotic action. The *second chorion* is formed by the external layer of the blastoderm, which is composed of cells resulting from the segmentation of the vitellus. This layer, by gradual pressure against the vitelline membrane, at first lines it, and then causing its absorption becomes itself the external envelope of the ovum or the second chorion. The *third chorion* is formed by the allantoid, which is applied to the internal surface of the preceding chorion, and causing its atrophy by pressure, becomes the external membrane of the ovum which remains until the end of gestation. This membrane is at first covered entirely by vascular villi which, at a later period, remain only at the place where the placenta is developed.

We thus find that these three parts are developed in the order mentioned; but the second chorion is not absorbed; it remains, on the contrary, until the fœtal evolution is completed, lined on its internal surface by the allantoid, the vascular loops of which enter the villi of the second chorion.

Consequently the allantoid never becomes a chorion, meaning thereby the external layer of the ovum, nor is there any other chorion properly so called than the second one formed by the external layer of the blastoderm; inasmuch as the vitelline membrane does not deserve the name, although after the example of Baër and Coste, it has been applied to it by some authors. The vitelline membrane exists, indeed, only before the formation of the embryo, and disappears as soon as the latter and its amniotic membrane become perceptible, leaving exposed the imperforate layer of the blastoderm, which takes the name of chorion. (Robin. *Journal de Physiologie*, 1861.]

But be that as it may, the chorion certainly does not exhibit the same aspect at the advanced stages of pregnancy: for during early embryonic existence the external membrane of the ovum is thin, transparent, and perfectly smooth on its outer surface, whilst about the second week this surface presents some minute granular elevations, which increase in length very rapidly, and the chorion soon becomes studded with numerous villi. But at that time neither the chorion nor the villi have a proper vascular apparatus, since it is not until after the allantois, together with the umbilical vessels, has become applied to the chorion, that vessels can be detected going from this membrane to penetrate the villi.

The chorion is enveloped in a great measure by the reflexed or epichorial decidua, which separates it from the parietal decidua; and is in contact, by a restricted surface, with a portion of the mucous membrane which constitutes the utero-epichorial or inter-utero-placental decidua. There is at the outset a considerable space between its external surface and the internal one of the pouch containing it, which space is occupied by its villi, and may become, as we shall see, the seat of a considerable effusion of blood.

Those villi which are in contact with the reflected decidua, penetrate at first, as they increase in size, into the substance of that membrane; they soon, however, become atrophied, and dwindle away almost completely, the interval disappears, and the two membranes come into immediate contact.

As regards the villi of the chorion, not covered by the reflected decidua, so far from being atrophied, they speedily undergo a considerable development, when they are in contact with the thickened and softened uterine mucous membrane (utero-placental decidua), and, intercrossing with the numerous vessels developed in its substance, contribute to the formation of that essentially vascular mass we are about to describe under the name of *placenta.*

The chorion is in apposition by its internal face with the amnios at an advanced period of pregnancy; but, as previously noticed, these two membranes are not concentric in the earlier months, being then separated by a considerable space that is occupied by the umbilical vesicle and an albuminous liquid, which is the more abundant and limpid as the gestation is less advanced.

After the development of the placenta, the chorion is a thin, transparent, colorless membrane, united outwardly to the decidua by some short, delicate filaments, the remnants of the atrophied villi, and inwardly to the amnios by an albuminous layer (*tunica media,* reticulated body). The part corresponding to the placenta is no longer in immediate contact with the decidua; it is thicker, and adherent to the fœtal surface of that vascular body, and the attachment is more intimate near the root of the cord. After what has already been stated, it were idle to discuss the vascularity of the chorion, for it evidently has no vessels until after the allantois has been developed; but from that period it consists of two laminæ, the external or primitive of which, also called the *exochorion,* is wholly destitute of vessels, whilst the internal or allantoid is essentially vascular, and has been denominated the *endochorion.*

ARTICLE IV.

OF THE ORGANS OF CONNECTION.

§ 1. THE PLACENTA. (*After-birth, Secundines.*)

The placenta is a soft, spongy mass, constituting the principal connection between the ovum and uterus, being destined to the hematosis, and perhaps also to the nourishment of the fœtus.

It is a flattened body, about three-quarters of an inch in thickness at the centre; but tapering off towards the circumference, which does not often exceed two or three lines; in some cases it is very thin, but then it is very large, and further, its figure and dimensions are exceedingly variable; thus, the ordinary diameter of the placenta varies from six to eight and a half inches, at times one diameter is longer than the others, and the shape, therefore, is circular, oval, &c., according to circumstances. The term battledoor-placenta has been applied to that variety in which the cord is inserted on the border. As a general rule, only one placenta exists in simple pregnancies. However, a very curious exception was observed quite recently at the Clinique of the Berlin Hospital, namely, a double placenta for a single child. Dr. Ebert furnishes the following description of this anomaly:

When displayed on a table, it was found to be divided into two exactly equal rounded parts, which were entirely distinct, having no connection whatever with each other, excepting through the intervention of the cord and membranes; an interval of about three inches separated the two portions. The cord was twenty-one inches long, containing, as in the normal state, the three vessels spirally arranged, but this spiral form ceased nearly two inches from the bifurcation of the umbilical vein, at this point the two arteries were placed, one on each side of the vein, and only communicated by a trifling anastomosis.

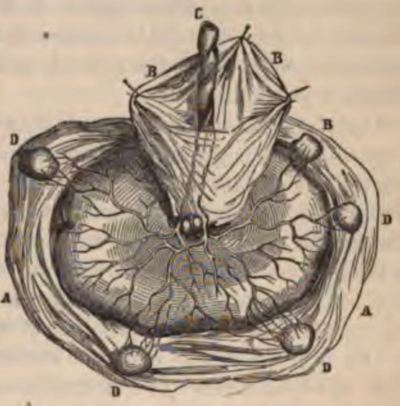
The vein bifurcated about four inches from the placenta; the two resulting branches were of unequal length, and the longest sent a branch to the opposite placenta. The arteries had a similar arrangement, one being sent to each after-birth. The one corresponding with the longest vein likewise sent a branch to the other placenta, but the interior subdivisions of the vessels offered no further anomaly.

The membranes formed a single cavity for the fœtus and amniotic waters; they invested the two portions of the cord, the fœtal face of both placentas, and passed from one organ to the other, thus establishing a kind of membranous bridge between them, which, with the cord, was the sole point of communication between these two masses. (*Arch. Gén.*, 1842, t. xiv.)

A similar case has recently occurred at the *Clinique d'Accouchement de Paris*, a drawing of which has been prepared by M. P. Dubois.

A placenta presenting the same anomaly, was recently exhibited by me to the Biological Society. This specimen derived additional interest from the fact, that it was the product of a double pregnancy, the other ovum having a distinct and regularly formed placenta.

FIG. 64.



Placenta, with five separate Cotyledons.
A. Chorion. B. Amnion. C. The Cord. D. Separate cotyledons.

A much more singular case has been obligingly communicated to me by Dr. Blot. In this instance, the placental mass presented nearly the usual appearance, but around it were distributed several entirely distinct cotyledons, which were connected with it only by the vessels proceeding from them to join the ramifications of the cord. (Fig. 64.)

The after-birth presents a *fœtal*, or *internal*, and an *external*, or *uterine* surface; also a circumference, or border. The internal surface is covered both by the chorion and amnion, and exhibits numerous ramifications of the umbilical arteries and vein, which generally converge about the centre of this body to form the umbilical cord. The uterine surface is much less smooth, polished, and uniform than the preceding, and is slightly convex, whilst the former is a little concave. It is subdivided into a variable number of lobes, or irregularly rounded cotyledons, held together by a lamellated, apparently albuminous tissue, which is so easily lacerated, that a rupture may occur during the separation of the placenta, so that after its expulsion, the cotyledons appear to be separated from each other by deep furrows or fissures. This surface is covered by a thin layer of adhesive matter through which the reddish and sanguinolent appearance of the cotyledons is perceptible.

Fig. 65.

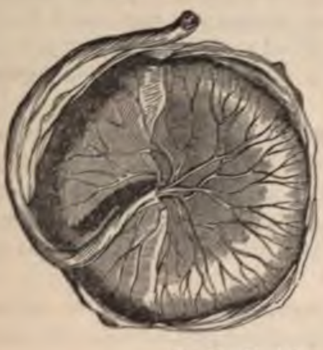


Fig. 66.

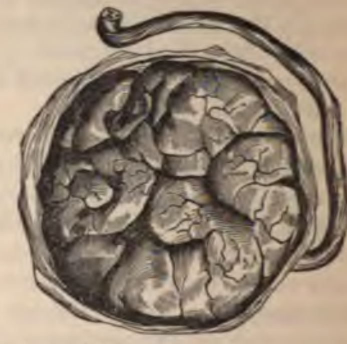


Fig. 65. The internal, or fœtal surface of the placenta.
Fig. 66. The external, or uterine surface of the placenta.

The placental circumference is thin and irregular, and its extent, although very variable, is generally about twenty-five inches. The margin, according to M. Velpeau, is continuous, without a well-marked line of demarcation, with the double lamina formed by the folding of the deciduous membrane. But in the opinion of other anatomists, the periphery of this vascular mass is continuous with the chorion, and only *contiguous* to the double fold of the decidua, which is there thicker and more dense, and presents a kind of triangular sinus for the reception of the placental border.

Our future remarks upon the structure of the placenta will serve to show that its circumference is continuous with both the chorion and the decidua; with the chorion by its fœtal portion, which, after all, is formed by the hypertrophied villi of the chorion; and with the decidua or parietal mucous membrane by its maternal portion, which is but a thickened part of this same uterine mucous membrane.

[*Structure.* — That we may not be misled whilst studying the structure of the placenta, I think it best to state briefly the manner in which it is formed.

The history of its development shows that it formed of the villi of the chorion, the growth and ramification of which give rise to innumerable filaments which ingraft themselves upon the intermediate mucous membrane to which they soon adhere closely. The maternal vessels undergoing an inverse development form vast numbers of loops, which descend between the villi of the chorion and extend to the fœtal surface of the placenta. An amorphous matter is soon deposited between the villi of the chorion uniting them together, and the placenta thus formed is at the same time a maternal and fœtal organ.

The separation of the placenta after delivery takes place at the most superficial portion of the intermediate mucous membrane. (See *Inter-utero-placental Decidua.*)

The fœtal placenta comes entirely away, bringing with it the epithelial layer of the inter-utero-placental decidua and the placental distribution of the maternal vessels. The thickest part of the intermediate mucous membrane remains, on the contrary, attached to the uterus. (See *Decidua*, and *Lying-in state.*)

Such, in short, are the principal phenomena which occur during the development and separation of the placenta, and they will serve to guide us amidst the different opinions which have been advanced respecting the structure of the organ.]

The structure of the after-birth has been a theme of numerous discussions among embryologists; but the researches of MM. Blandin, Jacquemier, Flourens, and Bonami, in our own times, and even yet more recently those of Reid, Weber, Coste, Eschricht, and Robin, have thrown much light on this subject.

We have sought laboriously for the truth amongst these different opinions; and in believing that we have found it in the facts established by M. Robin, we are no less convinced that the task has been greatly facilitated by the researches of his predecessors. In order to render justice to all, we consider it our duty to give an analysis of the principal investigations which have been made in reference to this interesting point of ovology.

If, while the placenta is still adherent to the uterine wall, a careful effort be made to detach it, we can easily see that this detachment takes place at the expense of a particular tissue, which at once separates and holds the two surfaces in contact. Now, this utero-placental substance is of an albuminous or membranous nature, and is composed, according to Robin, of the epithelium of the intermediate decidua. This membranous layer (that has also been accurately described by M. Jacquemier) is moulded, as it were, on the irregular surface of the placenta, to which the adhesion is more perfect than to the corresponding part of the womb; it dips into the fissures that separate the cotyledons, unless these should happen to be very deep, in which case it merely passes from one lobe to another, thereby forming a species of membranous bridge; but a partition of the same nature much thicker than the preceding penetrates deeply between the lobes. The lamina clothing the external surface of the placenta is continuous with the decidua, without exhibiting any other difference, says the same author, than a considerable augmentation of thickness; a disposition that is apparently mechanical, being due to the relief made by the projecting circumference of the after-birth, and which thus determines around that organ a greater accumulation of plastic material. According to that able anatomist, this membrane offers all the physical characters of the decidua; and he seems quite disposed to consider them both as being one and the same.

This inter-utero-placental tissue is traversed by a great number of venous and arterial vessels, which pass from the internal surface of the uterus to the placenta (utero-placental vessels); but it does not appear to be the ultimate termination of a single blood-vessel. No trace of the injection remained, in this tissue, in the preparations just alluded to, made by M. Bonami.

Let us proceed, however, to the vascular structure of the placenta, properly so called; and, as I have witnessed the injections of M. Bonami, I cannot do better than transcribe here the following parts of his thesis:

"An injection, composed of spirit-varnish, colored with red-lead, was first thrown into the venous system of the uterus through the primitive iliac and one of the ovarian veins. A second, consisting of spirits of turpentine and indigo, was then made of the uterine arteries through the inferior extremity of the aorta, ligatures being previously placed on all the vessels capable of transmitting the injected fluids to the inferior extremities.

"The uterine cavity having been opened at some distance from the placental insertion, and the fœtus stripped of its membranes, a blackish liquid, which was nothing but the blood, was next squeezed from the vessels of the cord; then injections, having linseed-oil colored with white-lead and yellow ochre as their base, were thrown into the umbilical vein, and into one of the arteries."

These injections were made with the greatest possible precaution, and the following results were afterwards obtained from a careful dissection: "At first, the red liquid injected into the uterine veins could be distinctly perceived on the fœtal surface of the placenta. But, by what canals could the injection have penetrated so far as this? Here was a new subject of research; but, by carefully turning the placenta aside, a considerable number of small vessels could easily be recognized, leaving the internal surface of the womb, traversing the inter-utero-placental tissue just described, and plunging into the substance of the placenta. These consisted of arteries and veins, readily cognizable as such by the different colored injections."

1st. *Arteries.*—The number of these is large, and they are more abundant near the centre of insertion than anywhere else; still, a few very delicate ones are found about an inch from the placental circumference. Generally, they are quite small, varying from a fourth of a line to a line in diameter. They assume very sensibly a spiral arrangement, and their course is oblique, almost always creeping along for a third of an inch, sometimes more, before their terminal extremities are directed towards the anfractuosities of the placenta; and they evidently penetrate the proper substance of the latter, though towards the uterus they are clearly continuous with the uterine arteries. Lastly, they have but few ramifications, and these rarely anastomose with each other.

2d. The *veins* pass from the uterus, through the inter-utero-placental membrane, towards the placenta, but they have not the same disposition as the arteries.

The calibre of these veins, says M. Bonami, is nearly equal to that of the arteries, sometimes even a little larger, some of them being from two to three lines in diameter. The characters by which we could distinguish these from the arteries, were conclusive in the piece under examination. Thus, these veins were penetrated by liquids thrown into the uterine venous system; they were rectilinear, and their exceedingly numerous ramifications anastomosed freely with each other, thereby forming vast plexuses on the cell-walls, which penetrated the uterine surface of the placenta at all points; and, on the other hand, by further dissection, could be seen with the naked eye terminating in the large uterine veins. Besides these, according to Meckel and Jacquemier, there exists a vein which encircles the periphery of the placenta; but this coronary vein is rarely complete, as it nearly always exhibits one or more interruptions of an inch or two in extent, although its continuity is sustained by a series of veins anastomosing with one another, and its course exhibits numerous varicose-like dilatations. It communicates, at short distances, with the uterine veins, and receives contributions both internally and externally; some of these spread over the uterine surface of the placenta, and anastomose with the veins that penetrate this body at its centre; the others, which are less numerous, ramify in the substance of the decidua, two or three inches from the circumference of the placenta. M. Robin says that it resembles a uterine sinus, and is more properly one of the latter excavated in the mucous membrane than a true vein. The presence of this coronary vein is not constant, for neither Velpeau nor Bonami have ever met with it.

There are, therefore, certain arteries and veins that penetrate the placenta, belonging to the maternal vascular system; but before studying their distribution, let us examine that of the umbilical vessels. These, consisting of the umbilical arteries and vein, having arrived at the fœtal surface of the placenta, divide into several large branches that are found between the amnion and chorion. The first of these membranes may be detached with great facility; but the second intimately adheres to the vessels, which it completely envelops, thus forming a sheath in which one artery and one vein are always found, the vein being much the larger; shortly after, each trunk divides into two branches, each of these into two others, and thus they go on subdividing dichotomously almost *ad infinitum*. The two umbilical arteries communicate freely with each other in the substance of the same cotyledon, and this anastomosis may even be seen without the aid of an injection. Again, if a coarse injection be thrown into one of the arteries, it will shortly return by the other; though, if the pressure be continued, it will pass from the arteries into the umbilical vein; but if we commence by filling the vein, the injection reaches the arteries with more difficulty. If a very penetrating mixture be used, the whole uterine surface of the placenta will be converted into a very delicate plexus, which never affords an outlet to the injected liquid; *patulous orifices do not exist, therefore, at the extremities of the vessels.*

When a placenta has been thus injected, and is then macerated, it soon appears to resolve itself into a substance resembling woolly flakes covered by numerous particles of a soft pulpy tissue, that is detached from them with much difficulty. These flakes present under the microscope a large number of granulations, composed of small, convoluted, twisted vessels, like those in the chorial villi of the cow or the sheep. These small granules have been described as *acini*, or little grains. The vessels become longer as the maceration is continued, and finally lose flexuosity almost entirely.

On the whole, therefore, the placenta is formed by vessels belonging to the mother as well as by those appertaining to the child, and each of its cotyledons is constituted in the following manner: the maternal, or utero-placental vessels penetrate at all points of its uterine surface, forming in its substance a net-work of exceedingly delicate meshes, while the umbilical vessels that penetrate on the fœtal surface present those infinite ramifications just described, and these twist around and embrace the contracted meshes of the maternal plexus in all directions. Further, the connection existing between these two orders of vessels appears to result from the membranous sheath that envelops them both, even into the substance of the placenta.

This sheath is furnished to one set by the chorion, to the other by the extremely delicate prolongations of the maternal vessels. In other words, being compressed and united with each other through the intervention of a common substance, these divisions and subdivisions form a cotyledon of the placenta.

Again, all the minute vascular ramuscles are so intimately connected that it is impossible to separate the vessels belonging to the mother from those peculiar to the fœtus, and they can only be distinguished from each other by the different colored injections. But, although the two series thus interlace, the maternal branches never communicate by their terminal extremities with those of the fœtus; since the finest injections, when most carefully made, have never established a direct communication between these two orders of vessels, — unless by rupture of the walls.

The description of Eschricht is very analogous to that of M. Bonami; thus, the former concludes that two orders of capillary plexuses are in contact in the human placenta, and that the uterine arteries are continuous with the veins of the same name through a capillary plexus, equally delicate with the one existing between the umbilical arteries and veins.

But the researches of Weber have led to different conclusions as to the mode in which the uterine arteries run into the veins of a similar name in the placenta, and these curious results deserve some notice, inasmuch as they seem to form a natural transition to the arrangement which we shall describe hereafter.

He states that the uterine arteries enter the after-birth without giving off any arborescent ramifications; and, on the other hand, that the veins do not arise by delicate ramuscles, but present, at their very origin, large trunks, which by anastomosing with each other very frequently and at all points, seem to form in this manner a system of cells, whence the blood then passes by some venous trunks into the uterine veins. These latter are continuous with the arterial tubes from their origin; their walls are excessively thin in the placenta, being there reduced to the internal coat, and collapse, so as to be nearly invisible when they contain but little blood. The terminal ramifications of the umbilical vessels project into these venous sinuses; moreover, the thin tunic ot the vein is pushed into the interior of the vessel by the fœtal villus resting against its outer surface, and it thus furnishes a sheath to the latter, which seems to penetrate to the interior even of the maternal vascular tube, though in reality it does not.

Read, in August, 1840, easily verified, he says, the existence of the utero-placental vessels, when examining the uterus of a pregnant woman, who died at the seventh month.

After having detached a portion of the placenta under water, my attention was drawn to a number of rounded bands passing between the uterus and the external surface of the placenta. When the least traction was made, their walls became thinner as their length increased, and had a cellular appearance, though they were easily lacerated; whilst sometimes, though more rarely, they seem to separate like the tufts of the uterine sinuses. By cutting into one of the sinuses, these tufts could be traced, and seen to ramify in its interior; some seemed to penetrate the patulous opening of the sinus only, while others sank in for about an inch, and appeared to penetrate even the surrounding sinuses. I could easily satisfy myself by injection and microscopical inspection, that these tufts were the ultimate ramifications of the umbilical vessels.

It is scarcely necessary to add, that these tufts only penetrate the openings of the sinuses situated near the internal surface of the uterus, and not those more deeply seated. Their volume varies very much, some appearing to fill the opening of the sinus entirely, whilst others only occupy it in part. Again, although the tufts appeared loose, and floating in the interior of the maternal vascular tube, yet they were evidently surrounded by the internal tunic of the latter, which was reflected on their external surface.

I have assured myself that some of the utero-placental veins contained no prolongation of the fœtal vessels, but in many others the villous tufts (the terminations of the umbilical vessels) could be recognized and followed into the uterine sinuses.

In tracing these utero-placental veins that contain no fœtal vessels through the decidua to the surface of the placenta, the internal membrane of such veins is found prolonged on the neighboring placental tufts; and further, by following a large utero-placental artery through the decidua, we may see that as soon as it arrives on the face of the placenta, its internal tunic is prolonged on certain tufts that are found plunged in its orifice.

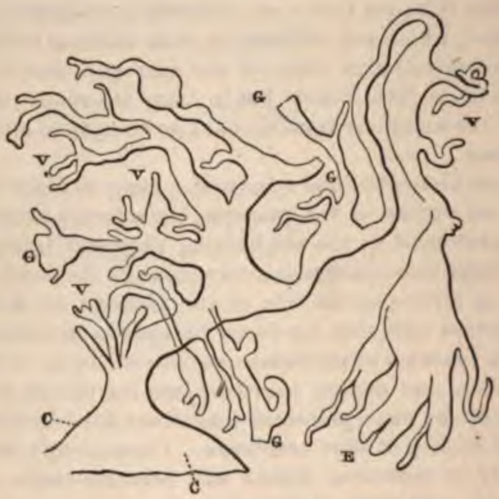
The numerous branches of the fœtal tufts which stop at the placental surface of the decidua, and neither penetrate into the uterine sinuses, nor yet into the orifices of the utero-placental vessels, are fixed by their extremities to the placental surface of this membrane. Consequently, the placenta is formed interiorly by numerous trunks and branches (each containing an artery and a vein), and each of these branches, both venous and arterial, is surrounded by a prolongation of the internal tunic belonging to the maternal vascular system, or at least by a membrane continuous with that tunic. Hence, in adopting such ideas of the placental structure, it becomes evident that the internal tunic of the mother's vessels is prolonged on each placental tuft, in such a manner that the maternal blood, arriving by the utero-placental arteries, passes into a large sac formed from the internal lamina of these vessels, and the blood is thus divided into a thousand different directions by the placental villi, which project like fringes into these vessels, pressing in their thin, soft parietes before them, and forming sheaths therefrom which completely envelop each trunk and each branch. The blood returns from this sac by the utero-placental veins without any extravasation or abandonment of the vascular system to which it properly belongs. Therefore, the fœtal blood, and that of the mother, can have no action upon each other, excepting through the spongy parietes of the fœtal vessels and the thin sac that surrounds them.

It will be seen, that but a single step has now to be taken in order to reach the description given by M. Coste.

It is really impossible to obtain a correct idea of the structure and development of the placenta, without being acquainted with the nature and structure of the villi of the chorion, as also with the changes undergone by that portion of the uterine mucous membrane (utero-epichorial decidua) upon which the ovule is ingrafted.

A. *Villi of the Chorion.*—We have already stated that before the allantoid is developed, each villus of the chorion contains a canal, which is open at its base, but terminates in a cul-de-sac at its free extremity; after the allantoid is developed, the terminal ramifications of the umbilical vessels, both arteries and veins, penetrate into this canal as into the finger of a glove. The villi, after having been thus rendered vascular, become atrophied, and finally disappear from all that part of the chorion which is covered by the reflected or epichorial decidua. Those, on the contrary, which are in immediate contact with the utero-epichorial mucous membrane (inter-utero-placental decidua of authors), undergo a considerable development, and ramify *ad infinitum.* When viewed collectively at this period, they have the appearance of a soft, hairy mass, very tufted and flaky, and of a semi-transparent gray rose-color.

FIG. 67.



This figure represents the manner in which the villi of the chorion ramify.—C C. Trunk of the villus. E. Terminal ramification intact. G. A terminal branch broken off. V. A lateral branch.

If the villi which compose this hair-like mass of the chorion be separated from each other and examined, the following characters will be found applicable to all: a common pedicle, forming the base or trunk of the villus, about one-sixteenth of an inch long, and one-half as wide, for an ovum of six weeks, the dimensions varying, however, with the size of the ovum. From this pedicle are put forth numerous branches, forming a bulky tuft. The largest of these branches, after dividing two or three times, are again subdivided into innumerable minute branchlets.

Again, some of the smaller branches stand alone upon the surface of the chorion, in the interspaces of the tufted pedicles just mentioned.

The extremities of the subdivisions of the third and fourth orders are here and there found to present a sort of cylindric or flattened swelling.

One of the principal subdivisions of the umbilical arteries and veins is distributed to each of these pedicles, and extends into all of its branches, ramifying as it goes.

Inasmuch as the branches of any one pedicle have no communication with those of a neighboring one, it follows that each tuft of the chorion has a circulation of its own.

Although the terminal villi become longer, their thickness is not sensibly increased, for their diameter is nearly the same after, as before the development of the placenta.

B. *Utero-epichorial Mucous Membrane.*—These hypertrophied villi come in contact with a very thick and much softened portion of the uterine mucous membrane. As they grow longer, they penetrate into the tissue of the mucous membrane itself, excavating therein a species of cells or lacunæ, which can be seen without difficulty upon the bottom of the receptacle represented in Plate III., Fig. 53.

Since the arteries, but more especially the veins, are so developed at this point that the frequent dilatations of the latter form large cavities or sinuses, from one-eighth to one-quarter of an inch in diameter, the vascular villi of the chorion necessarily come in contact with the walls of the uterine vessels. According to M. Coste, the latter are even worn through by the villi of the chorion, which having thus gained entrance into their cavities, are suspended freely in the blood which fills them.

Soon these infinitely numerous and elongated villi become united to each other by means of an amorphous substance, which is deposited in small quantity amongst them, so as to give to each tuft of the same pedicle the compactness which each placental cotyledon presents at a more advanced period of pregnancy.

The villi taken from the placenta immediately after labor, differ from those described only in the greater number of their ramifications, and the larger size of the pedicles and of the principal branches which they put forth.

The fœtal portion of the placental tissue is formed, in short, of interlaced filaments, which are simply the chief branches of the villi of the chorion, whose ramifications can be followed to their termination only by the use of a lens, so inextricably entangled are they, and agglutinated by the amorphous matter of which we have spoken. They thus form, by their agglomeration, a tissue of a reddish-gray color, soft, elastic, giving way to pressure of the finger, and yielding a filamentous fragment by tearing.

The structure of all the villi is not, however, identical at the termination of pregnancy. Although the greater number preserve until the end the double vascular canal which they presented at the beginning, the vessels of a few become atrophied, and like the non-placental villi, finally constitute a very slender filament devoid of a canal. Fig. 68, for which I am indebted to the kindness of M. Robin, exhibits these differences, besides showing very clearly the admirable disposition of the fœtal vessel within the villus itself.[1]

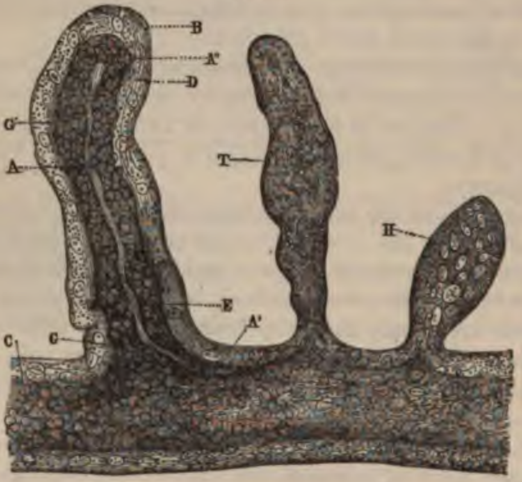
Thus H and T represent a terminal prolongation of the branches of a placental villus, ovoid in shape, with a contracted pedicle and obliterated cavity; at B is another terminal prolongation of the same villus, having the structure which almost all of them retain in the placenta. It is composed of an external envelope B, or wall of the villus, of a structure identical with that of the chorion. Its thickness, and consequently that of the substance separating the blood of the fœtus from that of the mother, may be estimated approximatively. It is about ·0004 of an inch.

This villus presents internally a partition, A, dividing its cavity into two vascular tubes. The tubes are situated beside each other, like the barrels of a double-barrelled gun; they bend toward each other at A″, so as to form a single canal at the extremity of the villus, which is arterial at D E, but venous at G′ G. This partition A has only half the thickness of the external wall B. It has a spur-like termination at A″, and adheres by its base at A′ to the wall of the villus.

When this disposition of the terminal ramifications is once understood, all discussion, as M. Robin remarks, respecting a direct communication between the maternal and fœtal vascular systems, is ended.

Each of the capillary vessels of this double canal empties into a corresponding one of larger size, at the point of junction or of separation of a ramification with a larger branch; for example (Fig. 68), the arterial tube D E empties at A′ into the trunk of the same nature of the principal branch C V, and the venous tube G′ G discharges at the point C.

FIG. 68.



The figure represents a fragment of the villi of the chorion obtained from the placenta. It exhibits prolongations of various appearance. Magnified 360 diameters.

---

[1] The minute details into which I am about to enter, are the analysis of the researches of my learned colleague and friend, M. Robin. They are for the most part recorded in an excellent memoir published by him, and also in the thesis of M. Cayla, one of his pupils.

The placenta is therefore composed of two parts, which are very distinct, in a physiological point of view, although they are confounded in a single mass at the end of gestation. One of these is the fœtal portion, and is more especially adherent to the chorion, from which it takes its origin; the other, the maternal portion, is a greatly thickened part of the uterine mucous membrane.

It is very difficult to say what is the real mode of connection between these two elements of the placenta, since such different results have followed the dissections of the most skilful anatomists.

Their continuity, or direct communication, is at present, however, out of the question, for all are united in regarding their relation as one of simple contact, a greater or less extent of adhesion.

[The foregoing represents what was known until within a few years past, of the structure of the placenta. More recently, Professor Robin, who at first accepted the ideas of M. Coste, has changed his opinion on the subject, and we have now to state his present views. (Various memoirs and oral communications.)

A close examination of the external surface of the placenta, will soon show that the entire surface of the cotyledons is covered by a grayish, semi-transparent, and soft membrane, from the $\frac{1}{50}$ to the $\frac{1}{10}$ of an inch in thickness in different specimens. This membrane, whose existence we have already asserted, is sometimes smooth, sometimes rough, quite elastic and adhesive, and of a peculiar appearance. It passes without interruption from one cotyledon to another, being only rather thicker in the interstices. It is formed by the epithelium of the inter-utero-placental mucous membrane in its thickened and hypertrophied condition. A few other elements, derived from the most superficial portion of the same mucous membrane, are also found in it, such as laminated fibres, amorphous matter, and molecular granules of various kinds.

This layer represents the maternal placenta, and is traversed by a profusion of maternal capillary vessels which pass into the body of the placenta. If these vessels be followed into the soft, grayish, and glutinous layer, just described, we find that they become gradually flatter and more irregular; they are distributed over the convex surface of the cotyledons and in their interstices, and at all these points enter deeply in an oblique direction toward the fœtal surface of the placenta. In pursuing this course, their walls become so extremely thin that they are often discerned with great difficulty. (Robin. *Communications orales.*)

Having entered the placental tissue, they dilate and communicate so largely as to form throughout the entire mass of the placenta a pool of blood, which bathes the entire placental surface of the chorion at the point of attachment of the pedicle of each villus.

This expanse of blood penetrates the fine sponge-like interstices between the reticulated ramifications of the villi, but nowhere is there any direct communication between the maternal and fœtal blood.

Beneath the preceding layer is found the fœtal placenta, which constitutes the greater bulk of the organ and is formed by the expansion of the villi of the chorion agglutinated by amorphous matter. Amongst these villi are distributed the numerous maternal vessels.

The glutinous layer, formed by the epithelium of the serotina at the surface of the placenta, is always present, unless accidentally removed: thus proving the very important fact that the placental villi are not plunged freely by means of floating extremities in the sinuses of the serotina. The cotyledons, it is true, project toward the utero-placental mucous membrane which, in its turn, penetrates somewhat into the furrows which separate the cotyledons: still, their convex surfaces are merely applied against the sinuses of the serotina, which glide between the villi in order to open into the above-mentioned pool of blood resulting from the enormous dilatation and the destruction here and there of the walls of the capillaries of the superficial net-work of this part of the mucous membrane.

The adhesion between the cotyledons and the mucous membrane is molecular and so intimate, that, instead of merely separating from the latter, it brings away with it the superficial layer of the serotina.

Notwithstanding this, it is true that, in an anatomical point of view, the cotyledons, in fact the placenta, are merely applied by the surface, against the intermediate mucous membrane. The fœtal villi are not plunged in the form of arborescent or radical branches in the tissue of the serotina, as all the descriptions would seem to indicate, but it were more correct to regard the maternal blood as seeking them at a certain depth in the mass of the cotyledons.]

The placenta appears to be destitute of nerves and lymphatic vessels.

All the cotyledons composing the placental mass are, as we have said, united by the interlobular membrane. Occasionally, however, one or several of these lobes are separated from the others, and seem to form another placenta by their isolation; in this way it has happened that several placentas have been attributed to a single fœtus, and, perhaps, the facts mentioned at the beginning of this article are to be accounted for in the same way.

The placenta may be inserted upon any part of the uterine cavity, and even upon its orifice, though most usually it is fixed near the fundus of the organ. It has been customary to account for these varieties of insertion, by saying that the latter is determined by the most vascular portion of the organ; overlooking the fact, that, although the point of attachment be indeed more vascular than any other part of the uterine parietes, it is simply because of the insertion, thus confounding the cause with the effect. According to some authors, the weight of the ovule determines the point of insertion of the placenta, which, if true, should most frequently take place upon the neck. Observation, however, refutes this opinion. Finally, according to MM. Moreau and Velpeau, when the ovule enters the womb, it is obliged to separate the decidua from the wall of the uterus, and therefore naturally tends towards the points of least resistance.

The details which we have given respecting the mode of formation of the decidua, show that the latter opinion is without foundation. The following seems to us to be the most probable explanation: Generally, by the time the ovule enters the uterine cavity, the latter is filled to repletion by the folded and swollen mucous membrane. This state of things renders it almost impossible that it should progress very far, and the consequence is, that in the vast majority of cases it lodges in one of the numerous folds near the fundus, and becomes attached in the vicinity of the orifice of the tube by which it entered. The placenta is, in fact, generally found in this neighborhood. Why, in some cases, it should be situated in the inferior segment of the womb, is of more difficult explanation, except upon the supposition that fecundation was effected after the arrival of the ovule in the uterine cavity; in which case, in consequence of the less swollen condition of the mucous membrane, it may have been able to obey the laws of gravity immediately upon entering the cavity, and thus descend towards the lowest points.

Sometimes the insertion of the placenta upon the lower segment of the uterus occurs in several successive pregnancies. Ingleby relates one case in which it happened three times, and says he knew the same thing to occur ten times in another. M. Dunal, from whom I quote the above, gives an observation of M. Ménard, in which the woman had this unfavorable insertion twice consecutively. Whether this sort of habit can depend upon a peculiar disposition of the Fallopian tube or of the uterus, is a question which anatomical research only is competent to decide.

§ 2. The Umbilical Cord.

The umbilical cord is the flexible trunk, which unites the abdomen of the child to the placenta; it does not exist during the early weeks of pregnancy, and its formation only commences when the embryo is completely separated from the blastodermic vesicle, which thereby becomes the umbilical vesicle; when the allantois, by being confounded with the external lamina of the blastoderm, no longer constitutes a distinct vesicle, but is merely a simple cord upon which the two umbilical arteries and the vein ramify; and when all these parts have received an enveloping sheath from the amnios. Now it scarcely appears thus formed until towards the end of the first month, being composed at this period, in all *normal embryos* of the age of the one which we shall describe (page 210), of three distinct parts: 1, of an enveloping canal, whose walls are formed by a reflection of the amnios, and which is continuous at the umbilicus with the skin of the embryo; 2, of two pedicles proceeding from the fœtal appendages, around which this amniotic canal forms a sheath, and which communicate, the one under the name of the *pedicle of the umbilical vesicle*, with the ileo-cœcal fold of intestine, and the other, under the name of *urachus*, or the *pedicle of the allantois*, with the bladder.

But soon after, as the development progresses, and the pedicle of the umbilical vesicle is absorbed, the cord becomes simplified, and is reduced to the amniotic sheath and the urachus, accompanied by the umbilical vessels, with which this sheath is confounded by the obliteration of the canal that constitutes it. The effacement of this canal, along which only the urachus and its accompanying vessels pass, progresses from the chorial extremity of the cord towards the umbilicus, or abdomen of the embryo; and, as the progressive obliteration approaches the latter, it encounters the intestine which advances beyond the umbilicus, and forms a hernia in the cord itself; but this rupture is naturally reduced, in consequence of the pressure exercised on the bowel by the progress of effacement, which ultimately reaches the navel, and presses back into the abdomen everything met with outside of its cavity. However, in some instances this process is not completed in so efficacious a manner, and the intestine in such cases remaining beyond the umbilicus, produces the malformation known as *congenital hernia;* a hernia that is nothing more than the persistence of an anatomical disposition, which always exists temporarily at a certain period of the embryonic life.

The cord, at the end of the first month, is still thin, cylindrical, and very small; but from the fourth to the eighth, and even the ninth week, it acquires a considerable proportional volume; and it exhibits either some enlargements, vesicles, or swellings, two, three, or four in number, which are separated from each other by a corresponding number of bands, or contractions.

During the third month it diminishes in size, in consequence of a retraction of these tuberosities; but again, commencing from this latter period it continues to grow proportionally to the other parts of the fœtus until the end of gestation.

The cord varies greatly in length at term: generally, it is from twenty-one to twenty-three inches; some have been observed, however, from six inches to five feet (one metre fifty-three centimetres); others, still more rare, have reached five feet nine inches in length (one metre seventy-five centimetres). I delivered a woman with the forceps, June 23, 1841, in whom the head had been retained above the superior strait, and where the cord was only nine inches long. These extremes are very rare; nevertheless, they are not the utmost varieties the cord may offer in its extreme limits, for it has been known not to exceed five inches, and has even been as short as two inches.

In a case reported by Mende, it was so short that the placenta absolutely seemed fixed to the child's abdomen. Its size likewise varies in different subjects, being generally about that of the little finger, sometimes much smaller, and at others very large; but in all these cases its volume depends much less on that of the vessels than on the quantity of fluids accumulated in the surrounding tissue.

The nerves and lymphatic vessels, which certain authors have described as belonging to the cord, are still a subject of research; admitted by some and denied by others, their existence is at least problematical.

The arteries are two in number, and, following the course of the blood, they arise from the bifurcation of the abdominal aorta in the fœtus, and reach the umbilicus, whence they traverse the entire length of the cord, describing numerous flexuosities as far as the placenta, in the tissue of which we have already followed their ramifications.

The vein, still following the route of the blood, arises from the numerous ramuscules studied in the placenta; the venous radicles of each lobe unite to form branches, which in their turn aggregate on the fœtal surface of the after-birth, to form there the trunk of the umbilical vein; and the latter, having arrived at the umbilical ring, abandons the two arteries, and runs towards the liver. (See *Circulation of the fœtus.*) The vein is nearly equal in size to the two arteries united; but it is much less flexuous, and consequently its course is shorter.

These vessels are wound upon each other in a way nearly similar to the twigs of osier forming the handle of a basket; they give off no branches in the cord, and it has been remarked that the twisting of the vessels, which only begins after the second month, takes place, nine times in ten, from left to right. The vein usually occupies the axis of the cord, and the arteries wind uniformly around it. Of course, this enrolling must depend somewhat on the torsions of the embryo itself, and then the entire cord, together with its sheath, is involved, as not unfrequently happens; but when the cord is straight, and the arteries are twisted at least more than it is, these contortions seem to result from a more rapid growth of the vessels within the sheath, than of the sheath itself (Haller). Now, the embryo and placenta being immovable, the turns starting from these two points will necessarily meet each other, and this indeed frequently takes place. Two, and even three umbilical veins have been met with in some cases; in others, instead of two arteries there is but one. Osiander once found three of the latter. It is worthy of remark, that neither the arteries nor the veins have valves at any part of their course.

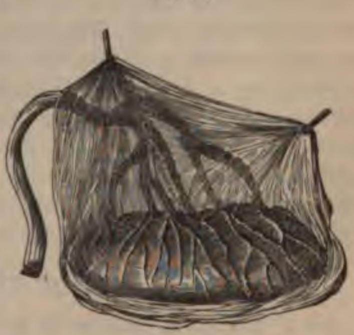
These vessels are surrounded by a gelatinous substance called *Wharton's gelatine*, which is variable in its quantity, thereby giving rise to the division made by accoucheurs into the thin and fat cords. This substance is continuous on one part with the sub-peritoneal cellular tissue of the fœtus, and, on the other, accompanies the vessels into the placenta. Being spongy in character, it is constituted by a clear, tenacious liquid, contained in the cellular areolæ, that communicate so freely with each other. The cord frequently has one or more knots when it is very long, some of which are formed during pregnancy, and often even at an early stage; but others are only produced at the period of labor: they never become so tightened (in gestation) as to compromise the life of the child, to whose movements they are certainly due; but we can understand that the cord may become tightly drawn during labor, from being shortened by circular turns around the trunk or neck; the knots, in such cases, may be so hardened as to intercept the circulation completely, and the death of the fœtus will necessarily result if the labor be prolonged. In one case, figured in the work of M. Baudelocque, the cord was knotted three times at the same place, and was interlaced like a mat.[1]

M. Soete, an accoucheur at Gheluwe, has described a very singular case of double pregnancy, in which the two fœtuses were inclosed in the same bag, and the two cords formed a perfect knot with each other.

Besides these knots, true nodosities likewise exist at times in the cord, produced either by the duplicature or the varicose state of one of its vessels.

We have already stated that the cord is attached by one extremity to the umbilicus of the child, and by the other to some point of the fœtal surface of the placenta; but this, however, is not always the case, for the facts are too numerous which go to prove that the cord may indeed be inserted on the head, neck, shoulders, and other parts of the

FIG. 69.



An anomaly, described by Benckiser.

---

[1] The ancients thought they could determine the fecundity of the female by these knots: thus, according to Avicenna, the more knots the more will be the future conceptions; and if they occur at some distance apart, the pregnancies will also be more distant from each other. — (*Israelis Spachii gynæceorum libri.*)

fœtal trunk, not to admit some of them, at least; such, for example, as the one observed by M. Jules Cloquet, at Brussels. The placental extremity of the cord also presents some anomalies; it is usually fixed very near the centre, but sometimes is found attached to a part of the periphery, bearing then the title of *the battledoor-placenta.* Nor is it always attached to a point of the fœtal surface of the placenta. For instance, Benckiser has collected in his thesis numerous cases in which the cord was inserted at some point on the periphery of the membranes; and having arrived there, the vessels of the cord then divide into five or six large trunks, the branches of which, by ramifying between the membranes, reach the placental circumference, and plunge into the parenchyma of this body. (See Fig. 69.)

All such modifications, however, merely depend on the way in which the allantois contracts its adhesions with the point of the ovum in contact with the womb. In fact, the placenta is always developed there, and if the allantois happens to strike the chorion at a point somewhat removed from that which is in apposition with the internal uterine surface, the umbilical vessels must evidently have a tendency towards the latter, just as the roots of a plant always stretch towards the spot which will afford them the most nourishment.

CHAPTER V.

OF THE FŒTUS.

WE shall not attempt to study the fœtus by describing the different organs, and the various tissues successively, that enter into its structure at the moment of birth, nor by tracing each of them through the modifications it undergoes at the divers periods of the intra-uterine life; for such a course would evidently compel us to overstep the limits imposed by the nature and character of this work. Therefore, laying aside all embryological researches, we shall content ourselves with mentioning a few interesting particulars of *organogeny;* and while considering the fœtus in a general manner, we shall point out succinctly the successive development of its form and its external parts. But before entering upon this subject, we believe it will prove profitable to present, in a figure, the various details already furnished, as such an exposition will complete the description previously made, and facilitate a knowledge of the facts we have yet to speak of.

EXPLANATION OF THE FIGURES IN PLATE IV.

FIG. 1. The human ovum, of its natural size, at about the thirtieth or thirty-sixth day.

FIG. 2. The same ovum (of its natural size) laid open to show its constituent parts.

A A. The chorion.

B. The amnion.

C. The fœtus.

D. The umbilical vessel.

FIG. 3. The same ovum highly magnified, and opened in such a way as to exhibit the principal relations existing between the embryo and its appendages. The walls

Pl. IV.

Fig. 1

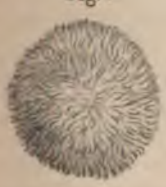


Fig. 2

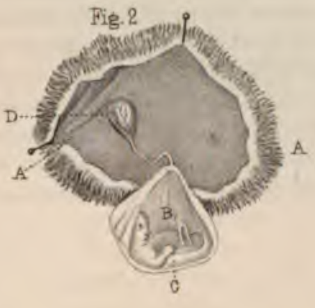
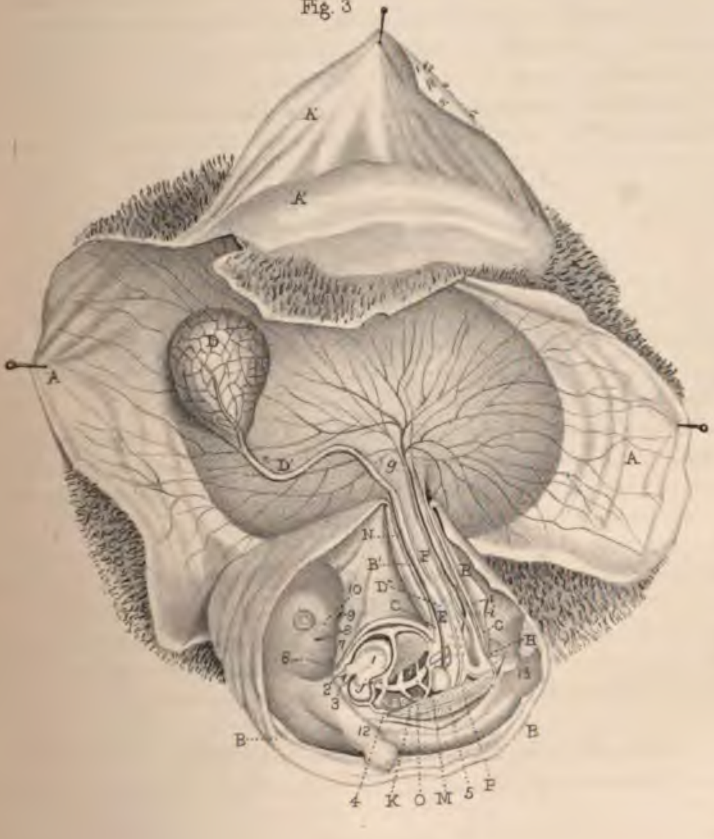


Fig. 3



T. Sinclair's Lith.

of the abdomen and chest have been cut away so as to bring the viscera into view, and the umbilical cord has also been split up, for the purpose of showing how the appendages of the fœtus are brought into relation with this latter.

A A. The chorion, consisting of two layers, placed back to back, and confounded with each other, but which have been dissected apart for a limited extent at A′ A′.

B B. The amnion, laid open, so as to show how it is continuous with the umbilical cord, along which it is reflected, thereby forming a sheath, which, under the form of the canal B′ B′, is directly continuous with the umbilicus or the abdominal walls C C of the embryo.

D. The umbilical vesicle, and D′ its pedicle.

D″. The point where this pedicle communicates with the intestine E.

E. The loop of intestine prolonged into the cord.

F. The urachus, continuous by one extremity, *g*, with the chorion, and by the other with the rectum at the point H.

i i. The umbilical arteries.

j. The umbilical vein.

j′. The part of the right auricle from which the umbilical vein comes off.

K. The vena cava inferior.

M. The inferior surface of the liver.

N. The omphalo-mesenteric vein.

O. The point where this vein empties into the umbilical vein.

P. The omphalo-mesenteric artery.

1. The heart.
2. The arch of the aorta.
3. The pulmonary artery.
4. The lung of the right side.
5. The Wolffian body.
6. The branchial fissure, which is converted into the external ear.
7. The lower jaw.
8. The upper jaw.
9. The nostril of the right side.
10. The nasal canal still forming a kind of fissure, which extends from the eye to the nostril.
11. The caudal extremity, or coccyx, projecting like a tail.
12. The upper extremity.
13. The lower extremity.

ARTICLE I.

DIMENSIONS AND WEIGHT OF THE FŒTUS AT THE DIFFERENT PERIODS OF INTRA-UTERINE LIFE.

At the time when the embryo first begins to be distinct, that is, about the third week, it is oblong, swollen in the middle, obtuse at one extremity, though drawn to a blunt point at the other, and straight, or nearly so, being somewhat curved forwards. It is therefore vermiform in shape, of a grayish-white color, semi-opaque, almost without consistence, and gelatinous, varying from two to four lines in length, and weighing one or two grains. At this period, the only trace of the head is a small tubercle separated from the rest of the body by a notch, but no rudiments of the extremities are observed, nor is there a cord at first.

The embryo is clearly surrounded by the amnion, which lies quite near it, in the form of a delicate membrane, leaving it, however, always free. The abdominal cavity is opened for a very considerable extent in front. The embryo becomes more consistent towards the *fifth week:* its head then increases greatly, in proportion to the remainder of the body, and the rudimentary eyes are indicated by two black spots turned towards the sides; the development of the thoracic extremities is announced by two small, obtuse nipples, situated on the sides of the trunk; it is nearly two-thirds of an inch long, and weighs about fifteen grains; the cord exists in a rudimentary condition, and the abdominal members are likewise present, in the form of two rounded pimples. The vertebral divisions are quite apparent, all along the back, although the caudal vertebræ closely approach the front part of the head, in consequence of the anterior curvature of the embryo.

Already does the heart exhibit, in its external form, a tolerably close resemblance to that in the adult; for we may even now observe the fissure that will afterwards separate the auricles, as also one corresponding to the inter-ventricular partition; but there is, in reality, only one ventricle, from which both the aorta and the pulmonary artery arise. And, further, there is but one auricle; or, rather, the two communicate so freely that the intermediary contraction which should divide them is still very imperfect; for the partition is formed by the progressive contraction of the orifice of communication, and this incomplete opening, which sometimes persists in the septum until birth, is known under the name of the *foramen of Botal.* But, after birth, the opening becomes obliterated, and the two auricles are thenceforth isolated by a complete partition.

The single ventricle will be converted into two cavities, by the intervention of a septum, which will be gradually developed from the summit towards the base, being placed between the two arteries (the pulmonary and aorta), and so disposed that one of them shall open into the right and the other into the left cavity.

The lungs at this period are constituted of five or six lobules, in which we can readily distinguish the bronchial extremities, terminating in slightly swollen cul-de-sacs. Moreover, two large glandular structures lie along the vertebral column at this period, extending longitudinally on each side, from the lung to the bottom of the pelvis. These are the Wolffian bodies. They are constituted by an excretory canal, which runs throughout their whole length, being placed on their external margin, and terminating below in the transitory cloaca. The canal puts forth, on one of its sides only, a series of more or less elongated cœca, which roll or curl up, so as to form a considerable mass by their agglomeration. These cœca secrete a liquid, which is subsequently emptied into the cloaca by means of the canal.

The Wolffian bodies anticipate the function of the kidneys until the latter are developed, and hence they have been denominated the *false kidneys;* but they disappear as soon as the true organs can replace them, leaving no trace of their past existence. Just alongside of the excretory canal, in the Wolffian body, a second one is seen to accompany it throughout, and even in like manner to empty into the cloaca. But this second canal is perfectly distinct from the other, and will become, in the adult, either the oviduct or the vas deferens, according as the new being shall be of the male or female sex.

In the early stages of embryonic life, there likewise exists on each side of the neck in the human fœtus, as also in the mammalia, four transverse fissures which open into the pharynx. These are separated from one another by certain bands, or fleshy partitions, that correspond with the branchial arcs of fishes; for the vascular apparatus distributed there affects, to a certain extent, the same form temporarily, that it has permanently in the inferior vertebratæ. We, therefore, see that the bulb of the aorta, instead of curving immediately in a single arch, divides, on the contrary, into three or four branches, on each side of the neck; and after these branches have each accompanied a branchial arch, they reunite, at a common point, to form the descending aorta; however, they are soon effaced, along with the corresponding fissures, and but two remain on the left side, one of which is converted into the arcus aortæ, while the other, after having existed as an arterial canal, will form the common trunk of the pulmonary arteries.

The branchial fissures just under consideration also disappear, with the exception of a single one (the first on each side), which is converted into the external ear, as may be seen in the figure. (See Plate IV.)

At this period, the upper jaw is still composed of two papulæ one for each side. These pimples, or isolated mandibles, gradually approach the median line, and there unite in a single body, which forms the jaw such as we find it in the adult.

The nostrils are separated by the incisive papulæ, which keep them apart for some time; then, as the latter diminish in size, they approach each other and assume their definitive form; but, in the meanwhile, they are separately split down to the mouth, and it is the permanence of this transitory state that constitutes the double hare-lip. All of the branchial fissures have disappeared by the sixth week, leaving only a slight cicatrix behind.

The first centres of ossification appear during the seventh week, first on the clavicle and then on the lower jaw. The intestine still extends for a considerable distance along the interior of the umbilical cord, but the omphalo-mesenteric canal is nearly obliterated, although it may yet be traced as far as the umbilical vesicle, where it is reduced to a very delicate thread. The anus remains closed; and the bodies of Wolff alone exist near the vertebral column. It is only then that the kidneys and capsulæ renales begin to appear, and soon after them the sexual organs. The urinary bladder is first manifested under the form of a tumor that is continuous with the urachus. At this time, the embryo is nearly an inch in length.

At two months, the tubercles of the extremities become more prominent. The fore-arm and hand can be distinguished, but not the arm; the hand is larger than the forearm, but it is not supplied with fingers. The cord has not as yet assumed a spiral arrangement, but it is infundibuliform in shape, the base corresponding to the abdomen, being continuous with it, and containing a large quantity of intestine; it is four to five lines in length, and is inserted near the lowest point of the abdomen. A small tubercle, furnished with one or more very contracted openings, may be distinguished between it and the termination of the spine, which are the rudimentary external organs of generation; but the extreme length of the clitoris renders the distinction of the sexes difficult at this period.

The embryo is from one and a half to two inches long, and weighs from three to five drachms, the head forming more than one-third of the whole.

The eyes are prominent, but the lids, from being still rudimentary, do not cover the eyeball; the nose forms an obtuse eminence; the nostrils are rounded and separated; the mouth is gaping, and the epidermis can be distinguished from the true skin.

At ten weeks, the embryo is from one and a half to two and a half inches in length, and weighs an ounce or an ounce and a half. The palpebræ, having become more apparent, descend in front of the eye, and the puncta lachrymalia are now visible; the buccal fissure, which has increased in size, begins to be obliterated by the commencing development of the lips.

The thoracic parietes are apparent; hence the heart's movements cease to be visible. The fingers are distinct, and the toes look like little tubercles held together by a soft substance. The cord is longer than the embryo, and begins to assume the spiral arrangement; it is less infundibuliform than previously, and is not inserted so low down on the abdomen, but its base always contains a portion of intestine.

At the end of the third month, the embryo weighs three to four ounces, and measures from five to six inches; the eyeball is seen through the lids; the membrana pupillaris is more manifest; the forehead and nose are clearly traceable, and the lips well marked and not turned outwards. The neck now establishes a visible separation between the head and thorax; the latter cavity is closed at all points, but is still very slightly developed relatively to the other cavities. The cord contains no intestine, and its spiral turns are more numerous and evident. The nails begin to appear as thin membranous plates; the sex is distinct, and the integuments, which heretofore were only a soft, viscous covering, acquire more consistence, but are still very thin, transparent, of a roseate hue, and without an apparent fibrous texture.

At the fourth month, the embryo takes the name of *fœtus;* its growth is not so rapid in the commencement as at the end of this month. The body is six to eight inches in length, and weighs from seven to eight ounces. The fontanelles are very large, as are also the sutures; and some short, whitish, silvery hairs may be observed on the head. The face still remains but little developed, although more elongated than it has previously been. The eyes, nostrils, and mouth are closed, and when the occlusion of the lids happens to be incomplete, it is generally at the internal part. The tongue may be distinguished behind the buccal fissure, and the projection of the chin is observable. The cord is inserted higher up on the abdomen, whence the centre of the body is an inch or two above the umbilicus. The skin has a rosy color, and begins to be covered by down; and some fat, tinged with red, is deposited in the areolæ of the subcutaneous cellular tissue, and the muscles now produce a sensible motion. A fœtus born at this period might live for several hours. Whilst I was Interne at the Hôtel Dieu, I received one that had scarcely reached the fourth month. It lived, however, from half-past seven to half-past eleven o'clock.

At five months, the length of the body is eight to ten inches, and it weighs from eight to eleven ounces. The skin is more consistent, and many patches of sebaceous matter may already be seen, but the pupils cannot be distinguished.

At six months, the length is eleven to twelve and a half inches, and the weight about one pound (avoir.). The hair is both longer and thicker, the eyes closed, the eyelids somewhat thicker, and their margins, as well as the eyebrows, are studded with very delicate hairs. Agreeably to most authors, the membrana pupillaris always exists; on the contrary, the pupil at this period has seemed very large, both to M. Velpeau and myself. The skin is better organized, for the dermis and the epidermis may be distinguished, though its surface is wrinkled and puckered, owing to the small quantity of subcutaneous fat. The nails are solid already. The scrotum is very small, quite red, and empty.

At seven months, the fœtus acquires a length of twelve and a half to fourteen inches; all its parts have become firmer and more voluminous, and their respective dimensions better proportioned. The bones belonging to the vault of the cranium exhibit near their centres a considerable prominence at the point where the first rudiments of ossification occur, whence it follows they are less uniformly arched than at the succeeding periods, and more curved than in the former months, when they were in reality nearly flat. The pupillary membrane disappears completely; indeed, according to M. Velpeau, this membrane does not exist at any period of the intra-uterine life. The iris commences as a simple ring, which then grows in a concentric manner, leaving at last only the opening called the pupil. The eyelids are partly open, and the testicles begin to descend into the scrotum.

At eight months, the fœtus seems to grow, as Desormeaux remarks, rather in thickness than in length; it is only sixteen to eighteen inches long, and yet weighs from four to five pounds. The skin is very red, and covered with long down, and a considerable quantity of sebaceous matter.[1] The lower jaw, which was at first very short, is now as long as the upper one. The scrotum usually contains one testicle, generally that on the left side.

Finally at term, the fœtus is about nineteen to twenty-three inches long, and weighs from six to seven pounds. Although, in consequence of the development at the inferior part of the trunk, the umbilical ring is now considerably removed from the hypogastric region, yet the insertion of the cord does not correspond, as has been stated, with the centre of the body. Thus, in a fœtus whose total length is twenty inches, we shall generally find ten and a half to eleven inches from the crown to the umbilicus.

Indeed, from the researches of M. Moreau, communicated to the Academy of Medicine, it appears that in ninety-four children born at nine months, four only had the umbilical insertion in the middle of the body, while in ninety others it was below this. The mean of the variations was nearly an inch. M. Ollivier, of Angers, has also observed the same thing in thirty children, examined by him.

---

[1] About the middle term of the intra-uterine life, the skin is covered by a constantly increasing mass of a fat, slippery, viscous substance, yellowish-white in color, called the sebaceous coat. This substance is more abundant on some embryos than on others, and is in greater quantity on certain places, as, for example, the head, axilla, and groins; it is insoluble in water, alcohol, and oil, and only partially soluble in potash. It is not a precipitate furnished by the amniotic liquors, as some persons have imagined, for there is none of it on the external surface of the amnios, nor on the umbilical cord; it is a secretion of the fœtal skin, and, so far as we can judge by its composition, is a mixture of effete epidermis and matters furnished by the sebaceous glands, which assist perhaps in the hour of labor by facilitating the expulsion of the child.

The weight and length of children at birth have been wonderfully exaggerated in many cases; thus, some are recorded of a yard or more in length, and others that weighed eighteen, twenty, twenty-four, and even thirty pounds. These statements must certainly be great exaggerations; for the most voluminous of three thousand children, born under my charge, either in the Hôtel Dieu or at La Clinique, weighed ten pounds, and it was an enormous one.

Of four thousand children delivered at La Maternité, one only weighed twelve pounds. (Lachapelle.)

Baudelocque asserts, that he superintended the delivery of one of twelve pounds and three-quarters; and M. Merriman, one weighing fourteen pounds; Richard Crofts, another of fifteen pounds; lastly, Mr. J. D. Owens, a surgeon at Haymoor, near Ludlow, has seen a still-born infant that weighed seventeen pounds twelve ounces, and had the following dimensions:

Occipito-frontal diameter,	7¼	inches.
Occipito-mental, “	8½	“
Bi-parietal “	6	“
Total length,	24	“

In the month of May, 1849, I was called in consultation by Dr. Riembault in a case of shoulder presentation. Several attempts at version had been made by himself and another physician, and it was with the greatest difficulty that I succeeded in accomplishing it. The child, which was born dead, appeared to me a very large one, and I estimated its weight at from ten to twelve pounds. After my departure, M. Riembault, who, like myself, had been struck with its size, weighed it carefully, once with a steelyard, and twice in different balances, and ascertained its weight, by the three trials, to be eighteen pounds. Its extreme length was two feet one and a half inches, the bi-acromial diameter nine inches, the greater circumference of the head sixteen and one-eighth inches, and the lesser circumference nine inches. M. Riembault has assured me repeatedly, that he could guarantee the accuracy of these statements, since being himself astonished at the results of the measurements, he had taken the precaution to repeat them several times.

The mother stated that her last menstrual period occurred July 12, 1848, and that she expected to be confined about the 12th of April, 1849. The size of the abdomen had been so great since March, as to lead her to suppose that she was pregnant with twins. The first pains were experienced on the evening of the 6th of May, that is to say, nearly a month later than she had anticipated. Whether the pregnancy had really run over its usual term, and whether the extraordinary size of the child was attributable thereto, are questions which it is impossible to decide.

On the whole, therefore, we may conclude that the fœtal growth is rapid for the first three months, then slackens off about the middle of pregnancy, and again becomes greatly accelerated during the last three months.

Chaussier has given the following as the proportions exhibited by the different parts of the fœtus at birth (taken from a child nineteen and a half inches long), namely:

From the top of the head to the pubis,	12¼ inches.
" the pubis to the feet,	7¼ "
" the clavicle to the bottom of the sternum,	2 "
" the latter to the pubis,	6¼ "

With regard to the *transverse* measurement, he found as follows:—

From the top of one shoulder to the other (bis-acromial or transverse diameter of the thorax),	4¾ inches.
From the sternum to the spine (antero-posterior diameter),	3¾ "
" ilium to ilium (transverse diameter of the pelvis),	3 "
" one femoral tuberosity to the other,	3½ "

We shall examine hereafter the dimensions of the head.

Fortunately, these diameters are reducible; thus, the *bis-acromial* in particular, which presents four and three-quarter inches, may be reduced to three and three-quarter inches, by compression.

ARTICLE II.

HEAD OF THE FŒTUS AT TERM.

The head of the fœtus merits the particular attention of the accoucheur, as being really the most voluminous and least compressible part of the child. It is, therefore, highly important to ascertain whether its several diameters are proportional to those we have heretofore studied in the pelvis. The head is likewise, in the majority of cases, the part which presents during labor; consequently, it is very necessary that we should be fully acquainted with all its characters, in order to recognize them at this period.

The fœtal head, considered as a whole, is ovoidal in form, the larger extremity being posterior, and the smaller anterior; as, in the adult, it is composed of the cranium and face; but as the latter does not claim a particular notice, we refer, for a knowledge of its different parts, to the works on anatomy. Several bones enter into the formation of the cranium; they are—

The *frontal.*—A symmetrical bone, forming the forehead, as well as the superior-anterior part of the face. It is divided in the fœtus into two portions.

The two *parietal.*—One upon the right, the other on the left side, meeting at the median line; they are situated upon the superior lateral parts of the head, and concur to form the vault of the cranium.

The *occipital.*—A symmetrical bone, constituting the posterior part of the skull, as also a portion of its base.

The *temporal.*—Two bones placed, one on the right, and the other on the left side, below and beneath the parietal, completing the lateral portions of the cranium, and contributing to the formation of its base; lastly, the *sphenoid* and the *ethmoid*, which belong exclusively to the base. These bones are not united to each other at birth by serrated articulations, as they are in the adult (*immovable synarthrosis*), but are separated, those of the vault especially, by membranous intervals, of greater or less extent, according to the degree of ossification. The intervals have received the name of *sutures*, or *fontanelles*.

This arrangement of the vault of the cranium have several advantages. It facilitates the development of the brain, and what is hardly less important in the view of the accoucheur, it allows of a certain reduction of the diameters of the head. When the latter is compressed forcibly, the margins of the bones approach each other and may even overlap.

The extent of this overlapping is liable to be thought greater than it really is, for, as M. Malgaigne remarks, if we examine the matter closely, we shall find that the membrane interposed between the parietal bones is too firm to be drawn out, and too narrow to permit a notable overriding; and further, that it usually maintains these two bones so close together, that the superior margin of one laps over the other, leaving even on the dried skull a true normal crossing. Some of those sutures, or fontanelles, are highly important in an obstetrical sense, and we shall next proceed to their consideration.

The Sagittal Suture.—This great or antero-posterior suture extends from the root of the nose to the superior angle of the occipital bone; being formed in front by the interval that divides the frontal bone into two halves, and in the middle, and posteriorly, by that between the parietals. At the superior and internal angle, formed by the two portions of the frontal bone, this suture is joined at the sides by the two *fronto-parietal* or *transverse* (coronal) sutures, which are formed by the space existing betwixt the superior border of the frontal and the anterior margin of the parietal bones, and crossing the former suture nearly at right angles.

Having arrived at the superior angle of the os occipitis, it seems to bifurcate, and give rise to two oblique lateral sutures formed by the posterior borders of the parietal bones, and the superior one of the occipital. These latter are called the *lambdoidal* sutures, probably from their resemblance to the Greek capital Λ (*lambda*). Just at the points where the fronto-parietal and the lambdoid sutures join the sagittal one, two membranous spaces, much larger than those just described, are found to exist, which have received the name of the *fontanelles*.

The great or *anterior fontanelle* is the one formed by the junction of the two transverse sutures with the sagittal. It is also called, from the fact of its corresponding with the bregma, the *bregmatic fontanelle;* in general, it presents an extensive surface, bounded by four bony angles, produced by the lateral sutures leaving it nearly at right angles. It is lozenge-shaped, and is usually much more prolonged into the frontal than between the parietal bones. Sometimes even, according to M. Gerdy, Jun., it scarcely ceases short of the nose, the margins of the coronal suture being parted throughout their whole extent by an interval which gradually diminishes from above downwards, being only about one or two lines wide toward the root of the nose. It is not at all uncommon to find at the lower part of this suture a rounded or oval membranous space, varying from three to seven lines in its diameter.

The *posterior* or occipital fontanelle is formed by the union of the two lambdoid sutures with the termination of the sagittal suture; it is smaller than the preceding, and of a triangular form, being bounded by three bony angles. The lateral sutures leave it at an acute angle. The bony angles are generally found in contact, no membranous interval being left between them. Sometimes the two portions of the os occipitis are not fused into each other at birth, and in such cases a median suture exists, which separates them, and terminates in the posterior fontanelle. The latter has then a lozenge shape, and is subtended by four osseous angles, and can only be distinguished from the anterior by the obliquity of the lambdoidal sutures. The opposite condition is observed at times, the triangular space known as the posterior fontanelle not existing at all, because the projecting angle of the occiput then fits in and fills up the entering one formed by the parietal bones; still the convergence of the three sutures, and the prominence of the bony margins which overlap each other, will aid the diagnosis (Malgaigne); for when the head is engaged in the excavation, and has become strongly compressed, the superior angle of the occipital bones is completely concealed by the internal or supero-posterior angles of the parietals; and if the touch is resorted to under such circumstances, the finger can only recognize the position by detecting the little hollow formed by the depressed occipital angle. Of course, particular attention must be given in this case to the oblique direction of the lambdoidal sutures.

The not unfrequent existence of spaces upon the cranium, where the ossification is less advanced than usual, is another source of error. For this defective ossification is substituted a membranous expansion, which might be mistaken for a fontanelle.

Such an error might the more readily have occurred in the four cases of this kind which I have had an opportunity of observing, from the fact of the accidental fontanelle being situated just in the course of the sagittal suture, about equidistant from the anterior and the posterior ones; and as this point is precisely where the finger first falls, in practising the touch, we might mistake it for a fontanelle. But, by a little attention, it will always be easy to avoid this error, by ascertaining that no lateral sutures pass off from this membranous interval.

There yet remain some other sutures, and some other fontanelles on the inferior lateral parts of the cranium; but as they are devoid of interest we shall not describe them.

Diameters of the Head.—The term diameter has been applied to certain fictitious lines, which traverse the head in a determinate direction. To avoid over-loading the memories of students, we shall not multiply their number as some have done; but, following the example of M. Velpeau, shall describe only seven at first, as it will be very easy to supply the deficiency hereafter in treating of the mechanism of labor.

Seven diameters, then, may be distinguished for the fœtal head, which we divide, in order to facilitate their study, into the antero-posterior, the transverse, and the vertical.

1st. The antero-posterior diameters are: the occipito-mental, *a b* (Fig. 70), extending from the posterior fontanelle to the chin; this is the longest of all, being five and a quarter inches. The occipito-frontal, *d e*, which extends from the occipital protuberance to the frontal boss (also called the antero-posterior diameter): it measures four and a quarter to four and a half inches. The sub-occipito-bregmatic, *c f*, extends from the middle of the space between the foramen magnum and the occipital protuberance (to the anterior fontanelle — *Transl.*), and is three and three-quarter inches.

2d. The transverse diameters are two in number: one, the bi-parietal, *a b* (Fig. 71), goes from one parietal protuberance to the other; it is from three and a half to three and three-quarter inches long. The other, the bi-temporal, *c d*, passes from the root of the zygomatic process on one side to the same point opposite. It is two and three-quarters to three inches long.

FIG. 70.

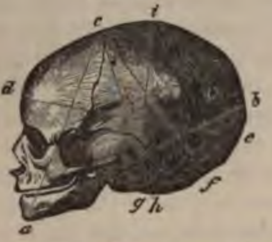
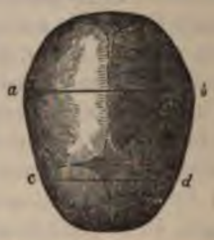


FIG. 71.



3d. Lastly, there are two vertical diameters: first, the vertical diameter, properly so called, or the *trachelo-bregmatic*, *i g*, traverses the head perpendicularly, passing from the most elevated point of the vertex to the anterior part of the occipital foramen. It is three and three-quarter inches long. Professor Moreau points out another diameter, which he calls the cervico-bregmatic, *c h* (Fig. 70); this leaves the preceding somewhat obliquely, and runs from the anterior part of the occipital foramen to the anterior fontanelle; it is three and three-quarter inches in length; the second, the *fronto-mental*, or the facial, *d a*, extends from the frontal boss to the point of the chin. This is three inches.

Circumferences. — A circumference has been assigned to each of the above-mentioned diameters, since it is very easy to describe from the middle of every one of them, as a centre, a circle whose radius is equal to one-half of the diameter, and whose circumference shall pass through the two extremities of the latter.

As a matter of course, the greatest circumference of the head corresponds with the occipito-mental diameter, and passing at the same time obliquely over the sides of the face and through the extremities of the diameter, has a nearly horizontal direction.

Most authors describe it as dividing the head into two equal lateral halves, — a mode of regarding it, which, as M. Jacquemier judiciously remarks, is devoid of meaning as applied to obstetrical practice.

The occipito-frontal periphery, agreeing with the diameter of the same name, runs, horizontally, a little below the extremities of the transverse diameter, and separates the vault from the base. The sub-occipito-bregmatic circumference passes through the extremities of both the occipito-bregmatic and the bi-parietal diameters, being thus common to both.

The two latter are the most important of all, because they successively come into relation with the parietes of the pelvis in the progress of natural labor.

The circumferences belonging to the other diameters scarcely offer any interest, and we shall therefore merely mention them in passing; in number they equal the diameters.

The fronto-mental circumference, however, should be noticed as passing over the forehead, cheeks, and chin: being also called, on that account, the facial circumference.

The diameters just described, although but slightly reducible in their dimensions, are not absolutely invariable. Thus it is only necessary to witness a few difficult labors to become satisfied, that in such cases the head is most frequently elongated in the direction of the occipito-mental diameter, and flattened in its transverse one. And we further learn, from the experiments of Baudelocque, that the bi-parietal diameter (see art. *Forceps*) may be reduced one-fourth, or one-third of an inch, by the aid of instruments; indeed, we have even known this diameter to be diminished much more than that under the efforts of the womb alone, without any accident occurring to the child.

Independently of those variations in length of the diameters of the head in individual cases, which it is impossible to foresee, there is one which is almost uniform for each sex, and of importance to be acquainted with. The head of the male fœtus is generally larger than that of the female; the difference, according to Clark, being about the one-twenty-eighth or the one-thirtieth. This difference exerts a notable influence upon the duration of labor even in well-formed women, and may consequently have an injurious effect upon the health of the mother, and upon both the life and health of the fœtus.

Thus it is shown by the researches of Dr. Simpson: 1. That the majority of the children which die during labor are males: the proportion of still-born boys to still-born girls being as 151 : 100. 2. That of children born living, there are more boys than girls presenting some morbid condition, or some lesion produced during labor, and consequently more likely to succumb within the first weeks of their existence. 3. That of the mothers who die during labor, or in consequence of it, the majority have given birth to boys.

It will be readily understood that the sex of the child will have a still greater influence upon the result of the labor where the pelvis is slightly contracted; and that with the same diameters, the life of a male fœtus would be often compromised when a girl might pass with little difficulty and no danger.

We present, in the following table, the diameters of the fœtal head, as also those of the pelvis, before described; hoping that, when thus collected, their study will be rendered more easy:—

Diameters of the pelvis. (In inches.)	Antero-Posterior.	Transverse.	Oblique.	Sacro-cotyloid.
Superior strait, . . .	4½	5¼	4¾	4 to 4⅛
Inferior strait, . . .	4¼ to 4¾	4¼	4¼ to 4½	" "
Excavation, ...	4¾ to 5⅛	4¾	4¾	" "

FŒTAL HEAD.

Longitudinal diameters, . .	Occipito-mental, .	5¼	inches.
	Occipito-frontal, .	4½	"
	Sub-occipito-bregmatic,	3¾	"
Transverse " . .	Bi-parietal, . .	3½ to 3¾	"
	Bi-temporal, . .	3	"
Vertical " . .	Trachelo-bregmatic, .	3½ to 3¾	"
	Fronto-mental, . .	3	"

The fundamental principles of midwifery are deduced from the correspondence between the fœtal dimensions and those of the pelvis. It happens, in fact, that the child at term can only clear the pelvic canal by presenting one end of its long diameter; that, whichever extremity this may be, the delivery will still remain impossible if the head should present in such a manner as to have its occipito-mental diameter *parallel* to those at the inferior strait; that, consequently, the occiput must always engage before the chin, or *vice versâ*; and, lastly, that the most favorable position of the head requires the latter to be strongly flexed upon the trunk, so that its smallest diameter (the sub-occipito-bregmatic) shall be parallel to the plane of the strait; and that to be in its most favorable relation with the pelvis, the occiput must correspond with one of the extremities of an oblique diameter.

The articulation of the head with the vertebral column, and the movements it permits, should also be carefully studied: thus, the occiput is connected to the atlas by a close union, which only admits the motions of flexion and extension, which in the fœtus are far more extensive than in the adult; the atloido-axoid articulation, on the contrary, being ginglymoid, only permits a rotation, which is limited to the fourth of a circle. Whence the conclusion is manifest, that whenever the head is caused to rotate—the body being fixed—great care must be exercised not to pass the limits indicated; for generally the fœtus would thereby suffer a mortal lesion. We say generally, not always, because two cases cited by Prof. Paul Dubois evidently prove that children may not only survive this accident, but even seem to experience no bad effects whatever from it.

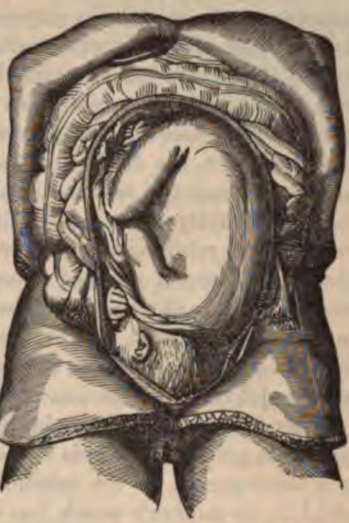
The great laxity of the articular ligaments in the infant can alone explain the little danger attending an occurrence which would prove so disastrous in the adult. Finally, the natural situation of the head is such in the newborn child, that the chin descends much lower than the occiput, and the axis of the trunk traverses the cranium obliquely from base to summit, and from before backwards, passing a little in front of the posterior fontanelle.

ARTICLE III.

POSITION AND ATTITUDE OF THE FŒTUS.

The fœtus lies curved on its anterior plane within the bag formed by the membranes; usually, the head is somewhat flexed, the chin resting on the anterior superior part of the breast; the neck is so short that a slight degree of flexion will, says M. Dubois, produce this effect; the feet are bent up in front of the legs—the latter strongly flexed on the thighs, and these again are applied to the anterior surface of the abdomen; the knees are separated from each other, but the heels lie close together on the back part of the thighs; the arms are placed on the sides of the thorax; the fore-arms are flexed and thrown across the sternum, so as to receive, as it were, the chin between the hands. The fœtus, thus folded on itself, constitutes a nearly ovoidal mass; the longest diameter of which is about eleven inches, having its larger extremity represented by the breech, which is turned towards the fundus uteri, while the smaller, formed by the head, is directed downwards. Now, it is evident that this constrained position could not have been produced by the mere pressure of the uterine walls on the child, since the latter is in a cavity much larger than its whole volume; hence, it must be referred to the individual itself.

FIG. 72.



The usual position of the child in the womb.

The pendent position of the head at term is so common, that we are naturally led to inquire why such should be the case? Formerly, it was supposed that, after having reached the uterus, the head occupied the fundus for the first seven months of gestation, and the pelvic extremity its inferior part; but that towards the expiration of this period, the fœtus reversed its position; the head approaching the orifice, and the breech going above.

This was the received doctrine until the arguments of Delamotte, Smellie, and more especially of Baudelocque, completely subverted it; and since then, it has been generally admitted that the fœtus, suspended, so to speak, in the amniotic fluid, by the umbilical cord, would naturally observe the law of gravity: that is, the head being the heaviest part would descend. This explanation was almost universally adopted, when M. Dubois, after re-examining the question, proposed another theory. He urged the following objections (whose value we fully acknowledge) against the influence of specific gravity, to which the great frequency of vertex presentations had been so uniformly attributed, viz.: 1. If a child be plunged into a considerable quantity of any liquid, contained in a bathing-tub, for instance, so that its descent will be very slow, in order to afford the head sufficient time to exert its superiority in weight, we shall find all parts of the fœtus to descend with an equal rapidity, and, consequently, either the back or one shoulder will first reach the bottom of the tub. This result, which is contrary to the general belief, is more in accordance with what is learned from an attentive examination of the fœtal structure; indeed, when a comparison is made, between the volume of the cephalic and the pelvic halves of the fœtus, it would naturally appear that their weight must be nearly balanced;

the cranial cavity, it is true, contains a well-developed brain, but the abdomen incloses the liver, which is no less so, as also the intestines and bladder, together with the meconium and the urine accumulated therein during pregnancy; 2. It is really impossible to believe that the fœtus is suspended by the cord alone, except during the early stages, for even at the third month the cord is longer than the greatest diameter of the uterine cavity, and therefore its insertion near the pelvic extremity can in no wise contribute to the more frequent presentation of the head; 3. Besides, those women who maintain the horizontal position during gestation on account of ill health, are not the less liable to exhibit the same phenomenon; 4. If the laws of gravity alone determined the position, the head being more voluminous relatively to the trunk, during the early months, the fœtus should present, in cases of abortion, by the cephalic extremity still more frequently than at term; but observation establishes the contrary; 5. Lastly, in animals the lowest part of the organ does not correspond with the neck, but rather to the fundus, of the womb; nevertheless, the fœtus is much oftener delivered by the head than the pelvic extremity.

After having tried to combat the generally received opinion by the objections just given, M. Dubois endeavors to prove that the vertex presentation is a consequence of the instinctive will of the fœtus itself. . . . . . The child, in its mother's womb, has the faculties of perception and motion; for the regular and nearly constant succession of the perception of impressions, and the movements which follow, sufficiently indicate the same connection in the fœtus, between these two functions, that should exist after birth.

Now, the object of these fœtal movements are partly certain, partly presumptive; consequently, they may be regarded as really instinctive determinations; again, it is in consequence of such a determination that the head in the mammalia is usually found at that part of the uterus nearest to the pelvic outlet.

We frankly confess that M. Dubois seems to us more skilful in destroying than in building up; and though the reasons by which he combats the doctrine hitherto received appear very strong, yet those whereon he founds his opinion are not fully convincing. He is entitled to credit, however, for having sought, in a higher order of ideas, the explanation of a singular fact, which does not seem, in the present state of our science, capable of elucidation by the material reasons heretofore given.

If we might be permitted to hazard an opinion, after so many others, we should unhesitatingly say they have erred by seeking only in the fœtus, its form and structure, for the cause of the various positions which it assumes in the uterine cavity.

Already have several authors endeavored to account for the rarity of trunk presentations, by the vertical, or the nearly vertical direction of the long diameter of the uterus, which would naturally force the greatest fœtal diameter in the same line: for instance, the cause of trunk presentations, says Wigand, must be referred less to the fœtus itself than to a change in the ordinary elliptic form of the uterus. Now, by advancing a step further in the path they have marked out, may we not find a satisfactory explanation of the great frequency of vertex presentations in the form of the uterus, and especially in its mode of development at the different periods of pregnancy? For, when we reflect that the uterus, being developed during the first six months at the expense of its fundus, is spread out superiorly, but, on the contrary, is much contracted below, does it not become evident that the pelvic extremity, which, from the folded condition of the lower limbs, is much more voluminous than the head, must naturally lie in the largest cavity, that is, towards the fundus; and, consequently, that the cranium will descend to the cervix? There can be no doubt that the inferior part spreads out in the last three months nearly as much as the fundus; but, then, the fœtal vertical diameter is too long to permit it to traverse the transverse diameter of the uterus; and hence, with some few exceptions, the child is forcibly retained in the position it first assumed.

Finally, can we not explain by this circumstance the position of twins, in cases of double pregnancy, where it frequently happens that one fœtus presents by the pelvic extremity, and one by the head? In a word, the child, shut up in its close sac, and constantly subjected to movement, must assume, not instinctively but mechanically, such a position as will bring its largest parts into correspondence with the most spacious portions of the organ.

ARTICLE IV.

FUNCTIONS OF THE FŒTUS.

The functions of the child, while it remains in the uterine cavity, that require our particular attention, are its nutrition, respiration, and circulation.

§ 1. OF NUTRITION.

Few questions in physiology have given rise to more discussion than this of fœtal nutrition. However, it is universally admitted that the nutritive materials are furnished by the mother's body; but authors are not as unanimous in regard to the mode of their introduction into the interior of the product of conception. For instance, some think that the liquids secreted by the internal uterine surface transude through the membranes, so as to reach the amniotic cavity, to be there taken up by the fœtus. Others regard the maternal placenta as designed to supply the child with nutritive matter, and find in the umbilical cord the only means of conveying it.

It is necessary to admit at the outset, that there can be no discussion of the question until after the placenta is developed, or at least, until after connection is established between the mother and child by means of the allantois. Now, as nothing of the kind exists in the early periods of pregnancy, it must be acknowledged that during this time, at least, the maternal fluids must reach the fœtus by endosmosis through the membranes of the ovum.

The nutritive matters cannot all be derived from the same source at the various periods of gestation. Thus, when the ovule quits the ovarian vesicle, it carries with it a portion of the granules which formed the proligerous disk; and it is probable that these may subserve its nutrition during its progress through the first half of the Fallopian tube. In its passage through the other half, an albuminous matter secreted by the walls of the tube envelops the ovule, and probably also penetrates through the vitelline membrane.

Arrived in the uterine cavity, the ovule comes in contact, at all points, with the mucous membrane of the uterus. The villi of the chorion undergo a considerable development, and until the placenta is formed, are all capable of imbibing the fluids secreted by the internal surface of the organ. As the canal with which each is provided opens into the cavity of the chorion, they are wonderfully adapted to this purpose; and notwithstanding the closure of their extremities, the uterine secretions pass by endosmosis through their thin walls; like the roots of a tree, they serve to convey the nutritive fluids into the space separating the chorion from the amnion. From thence, the nutritive juices transude through the walls of the amnion into its cavity. A certain portion of them is conveyed into the body of the fœtus through the canal of the umbilical vesicle.

But as soon as the vascular connections, which, as we have learned, are established between the maternal and fœtal placentas, begin to be formed, the non-placental villi of the chorion tend gradually to waste away; the development of the amnios obliterates the cavity which separated it from the chorion, and along with it also disappear the vitriform body and the umbilical vesicle. It now becomes a question, whether the nutritive matters supplied by the mother can penetrate into the amniotic cavity through the two membranes of the ovum, without collecting to an appreciable amount during the passage? Or, on the other hand, are they absorbed by the vascular radicles of the fœtal placenta, and introduced into the body of the embryo by means of the umbilical cord?

The partisans of the former opinion have endeavored to prove: 1, that the amniotic fluid is derived from the mother; 2, that it contains nutritive matter; 3, that it may enter the embryo in several ways.

A. It is almost certain that the fluid is supplied by the mother, for it is the more abundant as the child is less developed, and its quantity diminishes relatively to the fœtus, in proportion to the advancement of gestation. Now, the contrary should be true, were it a product of the fœtus itself. Besides, foreign matters introduced into the stomach of the mother, or injected into her veins, have been discovered in the amniotic cavity. It is also true, that they have nearly always been found at the same time in the blood of the embryo and in the placenta. So that, strictly speaking, it is difficult to say into what part they were first distributed. Very dissimilar observations having reference to this subject are on record. Thus, for example, in the case of an embryo of five months, the mother of which had been poisoned by sulphuric acid, Otto found that wherever the skin had come in contact with the amniotic fluid, it was of a reddish-brown color, and as hard as parchment. On the other hand, in the case of a woman four months pregnant, who had been poisoned by arsenic, MM. Mareska and Lados found, by analysis, traces of the poison in the body of the fœtus, in the uterus, and in the placenta, whilst it *could not be detected in the waters* of the amnion. Mayer, however, injected cyanide of potassium into the trachea of a rabbit, and afterwards discovered it in the amniotic fluid, the placenta, and the organs of the fœtus.

B. The amniotic fluid must be nutritive, for it contains albumen, osmazome, and some salts; in fact, young calves have been sustained two weeks on fresh amniotic liquor. Finally, the quantity of this fluid, and more especially that of the animal and nutritive substances found in it, is much diminished towards the end of pregnancy.

C. Supposing it to be furnished by the mother, and to possess nutritive properties, it remains to be shown how it is enabled to enter the body of the fœtus. There are numerous hypotheses in reference to this point.

The liquor amnii may reach the body of the fœtus in various ways.

1st. By *cutaneous absorption*. When the umbilical vesicle ceases to furnish nourishment to the embryo, the skin becomes developed, and, very probably, absorbs the surrounding amniotic liquid; it is even possible that the lymphatic vessels, which are highly developed in the fœtus, are formed as a consequence of this absorption, just as blood-vessels are called into existence by the circulation.

Brugmans proved this absorption by an experiment: thus, after having extracted several living embryos of animals from the waters of the amnios, he noticed that the cutaneous lymphatics were filled, and that those of the intestines were not so; then plunging the limbs, previously tied, into this liquid, he found, after the lapse of some time, the lymphatics below the ligature were filled with lymph.

The epidermis is so excessively thin, that it can offer no obstacle to the imbibition, and the liquor amnii itself contains a large proportion of water. Again, the sebaceous matter which covers the fœtus at birth, only becomes manifest at an advanced stage of pregnancy; and, lastly, this absorption has been directly proved in animals both by experiments and dissection.

2d. By *the intestinal canal*. Though the cutaneous absorption may suffice for the nutrition of the embryo, as is sufficiently proved by the birth of monsters and anencephalous fœtuses with closed mouths, nevertheless, it is highly probable that the child makes some efforts at deglutition, at least towards the termination of pregnancy, thereby determining the introduction of fluids into the intestinal canal. Thus, embryos may occasionally be observed executing motions of respiration with their jaws, during which the waters would necessarily be swallowed; indeed, in ova, that have been frozen after their extraction from the cow, an uninterrupted band of ice has been found extending from the mouth to the stomach. And when the meconium is mixed with the amniotic liquid, it is sometimes detected in the throat, pharynx, and stomach. Lastly, hair is occasionally found there, which could only happen as a result of deglutition.

Besides these two modes of absorption, by the skin and the intestinal mucous membrane, some physiologists have supposed this fluid might be taken up in other ways: thus, according to some, the mammary glands are provided with conduits that act the part of lymphatics, absorbing the waters, and carrying them to the thymus gland, to be there elaborated. Others suppose that the liquor amnii may enter the trachea and bronchia, and there undergo some modification which may render it suitable for nutrition. Lastly, Lobstein seems to think it might possibly enter through the genital organs. But all these opinions are merely hypothetical.

With all deference to their ingenuity, these hypotheses are still far from being satisfactory. The introduction of the liquor amnii into the intestinal canal as a regular and normal occurrence, is by no means proved by the facts cited in its support. It is, indeed, more than probable, that the movements of deglution which the child has been seen to make, were really respiratory efforts determined by the suspension of the placental respiration; also that the icicles, the hairs, and the meconium, found in the stomach, had entered it but a short time before the death of the child; in short, where the antecedent death of the mother, the compression of the cord, or the separation of the placenta had begun to produce asphyxia.

Supposing the cutaneous absorption of the liquor amnii to be proved by the experiment of Brugmans, it would still seem unequal to the development of the fœtus, which must have some additional source of nutrition.

Looking beyond the membranes, there evidently can be no other source of supply than the maternal placenta, and, in fact, many modern authors regard the placental circulation as the principal agent in the nutrition of the fœtus. It is unnecessary to suppose a direct communication between the maternal and fœtal vessels, in order to understand how that, by means of the extensive contact existing between the vascular apparatus of the two placentas, a transudation may take place of the more fluid parts of the maternal blood, which are absorbed and mingled with the fœtal blood; also that this transuded fluid being charged with oxygen is subservient to the hæmatosis of the fœtal blood, at the same time that it supplies it with nutritive material. (Van Huevel.) It may, perhaps, be allowed, that all of the villi of the chorion, in the midst of which the placenta is developed, may not be applied to the formation of the radicles of the umbilical vessels, but that some of them may continue to exercise their primitive functions, and still absorb the fluids secreted by the utricular glands of the utero-epichorial mucous membrane.

What we have already said regarding the structure of the chorial villi of the placenta lends countenance to this supposition; for we have seen (Fig. 68), that beside the vascular villi, some are found to be solid, and destitute of any ramification of the umbilical vessels, although still adhering by their pedicle, and communicating with a larger branch of the villus. This fact seems, indeed, to have been anticipated by some authors: thus, although Eschricht regarded the placenta proper as being in reality the respiratory organ of the fœtus, he supposed that the utricular glands of the womb secrete a fluid designed for the nourishment of the embryo, which fluid is taken up by other branches of the umbilical vessels than those by which the placental respiration is effected; MM. Prévost and Morin also regard the placenta as the organ in which the absorption of the plastic matters supplied by the mother is accomplished by the vessels of the fœtus. According to them, this fluid, which is deposited upon the internal surface of the womb, is taken up by the vessels of the cotyledons. Thus, in the ruminantia, if the ovum with its cotyledons be extracted from the womb towards the end of gestation, by which, consequently, the fœtal and maternal placentas are separated from each other, the separation being easily effected without laceration, a whitish fluid is discovered in the uterine caruncles, and a similar one can be expressed from the vascular brushes of the cotyledons. However this may be, it is very probable that the nutritive fluids reach the fœtus through the umbilical vessels properly so called.

When mixed with the fœtal blood, the nutritive elements supplied by the mother, are, like the chyle in the adult, devoted to the development of the organs. Lee supposes, however, that they undergo certain changes, first in the liver, and afterward in the intestine. When thus brought by the umbilical vein into the large liver of the fœtus, these elements experience changes which result in the formation of a new albuminous and nutritive compound which is poured along with the bile into the duodenum; there the mixture is separated into a recrementitial part, which is taken up by the absorbents, as in the adult, and an excrementitial part, charged with carbon, which forms the meconium.

In fine, until the placenta is formed, the nutritive elements reach the interior of the ovum by means of endosmosis; at a later period the growth of the fœtus is maintained by an absorption through the skin of some of the nutritive matters contained in the liquor amnii, and by the assimilation of those which the radicles of the umbilical vessels take up in the placenta.

[It should be added, in reference to this subject, that in the fœtus, as well as in the adult, glucogenesis is one of the essential conditions of nutrition. After a fruitless search for glucogenous matter in the fœtal liver, M. Bernard found it in the placentas of the mammalia, being especially present in the epithelial layer of the inter-utero-placental mucous membrane. To the already determined functions of the placenta we have, therefore, to add this of glucogenesis, which would seem to replace the hepatic function in this respect during the earlier periods of embryonic life.

In the ruminantia, the glucogenic matter having become separated from the placenta, is found spread over the free surface of the amnion and chorion in the form of epithelium-like scales, which are easily seen, but which have not hitherto been understood. (Cl. Bernard. *Lecons de Physiologie*, 1855.—*Memoires de la Société de Biologie*, 1860.)]

§ 2. RESPIRATION.

Does the fœtus respire in the amniotic cavity?

If something analogous to respiration in the adult be sought for in the functions of the fœtus, this question will doubtless be answered negatively; because the atmospheric air having no access to it whatever, the fœtal blood could not possibly obtain any elements from it. But does it, therefore, follow that the sanguineous fluid will experience no similar modification at any part of the circuit? Most physiologists think otherwise, and I share their opinion.

According to some, the liquor amnii is the modifying agent for the blood, and Beclard supposes that the lungs are the seat of such changes, the amniotic liquid reaching them through the air-passages. Agreeably to M. Geoffroy St. Hilaire, the whole surface of the child's body absorbs air, or a vivifying gas, like insects, by a species of air-tubes, or by minute fissures which exist on the lateral parts of the neck in young embryos. The resemblance between those fissures and the branchial apparatus in the fish has given rise to the belief of an analogous function; hence, they are called the *branchial fissures*.

This book is the property
COOPER MEDICAL COLLEG
SAN FRANCISCO, CAL.
and is not to be removed from
Library Room by any per
under any pretext whateve

But, says Bischoff, in the mammalia and man, these arcs never have an organization justifying in the least the supposition of their being intended for respiration; they never have internal nor external branches; nor do we ever see, as in the *branchia*, vessels distributed either on their surface or in their interior.

Latterly, M. Serres has attempted anew to explain how respiration may take place in the embryo before the placenta is fully formed. He says the breathing apparatus of the human ovule consists of the chorion, the two layers of the decidua, the liquid contained between the latter, and of a particular class of villi, called by him the *branchial*, which, after having traversed the reflected decidua, come into contact with this liquid. On the one hand, the reflected decidua is perforated by multitudes of foramina, which may be aptly compared to those on the cribriform plate of the ethmoid bone; and on the other, the chorial villosities, the *branchial* villi, entering the substance of this membrane, lodge in those openings, and thus are brought into immediate apposition with the liquid. M. Serres believes that this arrangement presents all the conditions of a branchial respiratory apparatus; but this mode of respiration only lasts during the first fifteen or twenty days of the intra-uterine life; because, as the embryo is developed and grows, one part of the villi of the chorion is transformed into the placenta, and the fœtal respiration in the uterus then commences the second time, as the placental respiration. Then the branchial function decreases, the apparatus atrophies and disappears: at first, the branchial villi of the chorion wither away; the cavity of the decidua is contracted; the liquid diminishes; and, finally, the two laminæ of the decidua being brought into apposition, unite and become confounded with each other.

This hypothesis, though ingenious, is evidently based upon badly observed facts, and cannot be sustained after the description of the decidua which we have given.

After the allantois is developed, the villi of the chorion, which have then become vascular, are in immediate contact with the hypertrophied vessels of the mucous membrane, and from this moment the fœtal blood derives therefrom the elements necessary to hæmatosis. In proportion as the contact becomes more intimate and extensive, the organization of the placenta progresses, and soon forms a compact mass, which is the seat of the placental respiration.

In fact, this body is formed throughout in such a manner as to establish the greatest possible approximation between the maternal blood and that of the embryo; and this mediate union, in which the two liquids are separated by fixed membranes, establishes between the fœtal and the maternal blood the same relation that is known to exist in the lungs of the adult, betwixt the venous blood and the atmospheric air: thus, in the pulmonary organs, the blood is brought within the influence of the inspired air; true, there is none of the latter in the after-birth, but the maternal vessels are found there in great abundance, whose exceedingly delicate walls remain for a long time in contact with the umbilical radicles, the parietes of which are also thin and transparent.

Therefore, if nothing but thin, transparent membranes divide the fœtal blood from that of its mother, is it not possible for the first to communicate some of its elements to the second? for, does not the air act through the walls of the pulmonary vessels of the blood contained therein? And further, is not such a modification of the fœtal blood in the placenta sufficiently proved: 1st. By the early death of the child, when the umbilical cord becomes flattened from compression, and its circulation thereby arrested. 2d. By the pathological phenomena of asphyxia, which are always revealed by the autopsy in such cases. 3d. By the antagonism known to exist between the after-birth and the lungs; in fact, the new-born infant may dispense with the pulmonary respiration, so long as its connection with the placenta remains uninterrupted, and this communication may be broken without danger as soon as it respires through the lungs; if it breathe freely, the blood no longer passes along the cord, and, should respiration cease, it shortly flows anew. And 4th. By the difference in the blood circulating in the umbilical vein, and that in the arteries,—a distinction not very manifest upon simple inspection, but which has been detected by physical and chemical experiments. Now, in the adult pulmonary respiration, the blood not only absorbs a certain portion of oxygen from the air, but it also gives off some carbonic acid. Thus far, we have only learned that the fœtal blood derives from the placenta a vivifying principle; but we have not observed the separation of those materials from it, which may be unsuited to the nutrition of the child. We may state, however, that most physiologists believe the liver is destined to the performance of this last elaboration, and to the removal of its superabundant carbon and hydrogen, which latter are employed in the formation of the bile, and contribute to the complete development of the organ. We know, in fact, that the growth of the liver follows that of the placenta, that both have a perfect organization at the same periods, that the bile is a highly carbonized fluid, and that the liver has a similar chemical composition.

§ 3. CIRCULATION.

A. The fœtal vascular apparatus exhibits certain anatomical peculiarities that do not exist in the adult, and which must be noticed, in order to render the account of the circulation comprehensible. Now, these characteristics evidently depend on the absence of the pulmonary respiration, for they disappear as soon as it is established; thus:—

1. It is well known that the heart in the adult is composed of four cavities: namely, a right and left auricle, and a right and left ventricle, each auricle communicating freely with the corresponding ventricle, but not with its fellow, being separated from it by a complete partition. In the fœtus this dividing wall exhibits an opening, called the foramen of Botal, which becomes smaller as the pregnancy advances, and is wholly obliterated after birth, in consequence of a valve being developed on its inferior margin which gradually diminishes the freedom of the passage, and is large enough at term to obliterate the orifice entirely.

2. In the adult, the pulmonary artery divides into two large branches, one for each lung: these ramify throughout its ultimate tissue, distributing therein the venous blood derived from the right ventricle; the blood is next

taken up by the radicles of the pulmonary veins and carried back by them to the left auricle. This vascular circle is interrupted in the fœtus, in which the two pulmonary arteries are very small, although their common trunk gives origin to a voluminous canal which opens directly into the arcus aortæ, and is called the arterial canal or the *ductus arteriosus.*

3. The abdominal aorta bifurcates, so as to form the primitive iliac arteries, and each of these again divides into two branches, the hypogastric and the external iliac. In the fœtus, the hypogastric seems to be continuous with a large vascular trunk called the *umbilical artery*, but this is nearly obliterated in after-life. The two umbilical arteries run forwards and inwards along the lateral and superior parts of the bladder, and soon curve forwards so as to reach the inner surface of the anterior abdominal wall, along which they ascend to the umbilicus, then pass along the cord, and ultimately ramify in the placenta.

4. Lastly, the fœtus further differs from the adult in having an umbilical vein, which, commencing by numerous ramifications in the placental tissue, traverses the whole length of the cord, and reaches the abdomen by passing through the umbilical ring; then, running upwards and to the right in the substance of the suspensory ligament of the liver immediately behind the peritoneum, it gains the horizontal or umbilical fissure of this organ at its anterior part, where it gives off a few branches that ramify in the right and left lobes. Just at the point where the two fissures of this viscus intersect each other, the umbilical vein becomes enlarged, and then divides into two branches: the posterior of which, called the venous canal, or *ductus venosus*, is a continuation of the primitive trunk, and goes sometimes to the vena cava inferior above the diaphragm, though at others it joins one of the hepatic veins, and the common trunk thus formed empties into the vena cava; the other branch is much larger, and runs to the right; it leaves the principal trunk lower down and more in front than the venous canal; then it unites with the vena portæ, producing a canal whose diameter is double its own. This is called the *canal of reunion*, or the confluence of the portal and umbilical veins. After a short course, this vessel subdivides and ramifies in the substance of the liver, anastomosing with the hepatic veins, which (as in the adult) finally reach the vena cava a little above the ductus venosus.

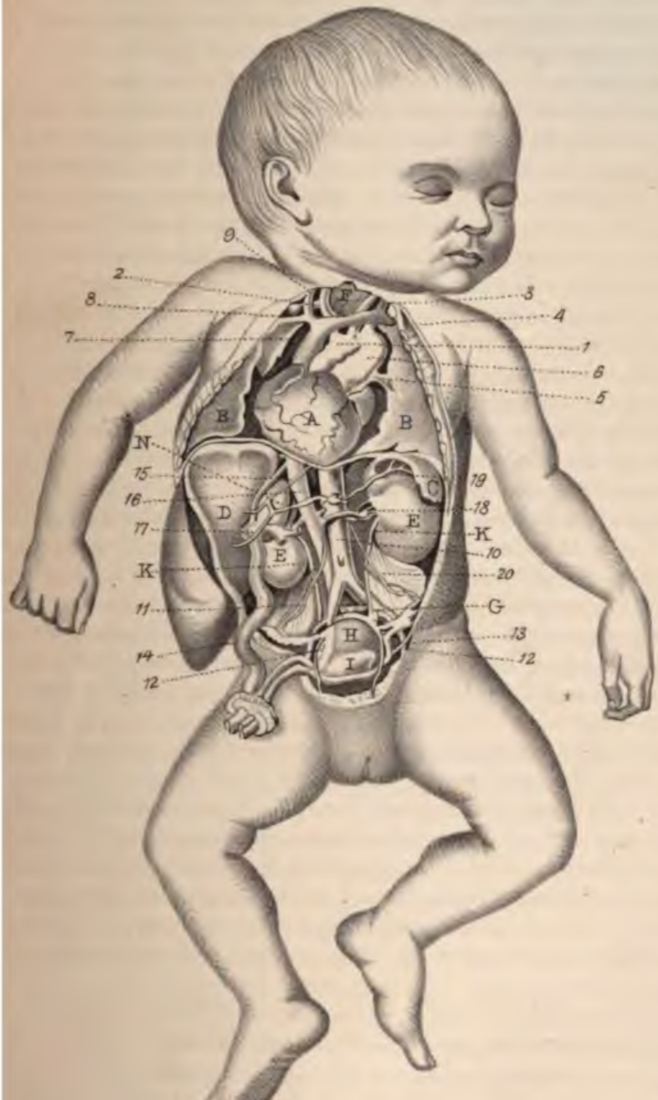
Plate V., together with the accompanying explanation, illustrates the whole vascular apparatus of the fœtus, and to it the reader is referred.

EXPLANATION OF PLATE V.

WHICH EXHIBITS THE WHOLE VASCULAR APPARATUS OF THE FŒTUS.

A. The heart. B B. The lungs. C. The spleen. D. The liver. N. The lobulus spigelii. E E. The kidneys. F. The thymus gland. G. The upper extremity of the rectum. I. The bladder. K. The ureters. H. The womb. O. The umbilical cord. 1. The aorta. 2 The brachio-cephalic trunk. 3. The left primitive carotid artery. 4. The left subclavian artery. 5. The pulmonary artery. 6. The ductus arteriosus 7. The vena cava superior. 8. The right internal jugular and the right subclavian veins. 9. The left subclavian vein. 10. The abdominal aorta. 11. The primitive iliac arteries. 12. The umbilical arteries, coming off from the bifurcation of the primitive iliac. 13. The external iliac artery. 14. The umbilical vein. 15. The ductus venosus. 16. Vena cava inferior. 17. The vena portarum. 18. The renal artery and veins. 19. The splenic artery. 20. The ovarian vessels.

Pl. V.



T. Sinclair's Lith.

B. Now, having acquired these anatomical views, let us see what is the course of the blood in the fœtus. A part of this fluid, circulating in the umbilical vein, is, therefore, discharged by the venous canal directly into the vena cava; another part is distributed to the liver, where it probably undergoes, as before stated, some purification, and thence is brought back by the hepatic veins to the vena cava. Consequently, all the blood from the umbilical vein reaches the vena cava inferior either directly or indirectly. The blood contained in the latter is therefore a mixture of that which returns from the inferior extremities of the fœtus and of that poured into the liver by the vena portæ, with the addition of the portion contributed by the umbilical vein. This compound reaches the right auricle through the ascending vena cava, where it only mixes partially with the blood of the upper extremities, which has been brought back by the descending vena cava; because, in passing into the auricle, the ascending or inferior vena cava is directed towards the foramen of Botal, and hence its blood passes in a great measure through this opening into the left auricle, and thence into the left ventricle. By the contractions of this latter the fluid is then forced into the aorta, its impetus being broken against the great curvature of this artery; and the blood then passes into the vessels which arise from the arch, and is distributed through them to the head and superior extremities, a very small portion of it only reaching the descending aorta and the lower parts of the body.

The blood, after having thus supplied the upper half of the body, is collected by the veins, which, by their successive union, form the superior or the descending vena cava; the latter empties into the right auricle, where a small quantity of its blood mixes with that brought by the ascending cava; but much the largest part passes directly into the right ventricle, which forces it into the pulmonary artery.

This vessel sends but a trifling portion to the lungs; the rest being thrust into the ductus arteriosus, which discharges its contents into the aorta: that is to say, the blood that has contributed to the nutrition of the superior parts of the body, and has traversed the descending vena cava, the right auricle, the right ventricle, and pulmonary artery, and then has passed through the ductus arteriosus, finally mingles with the remnant of blood still existing in the descending aorta. The whole now descends to the inferior part of the latter vessel, where a small portion of it is sent through the arterial trunk to supply the inferior extremities, whilst much the largest quantity is driven into the umbilical arteries, and is carried by them back to the placenta: where, after having undergone the modifications produced by the placental respiration, it is again taken up by the radicles of the umbilical vein to once more traverse the same circuit.

C. *Of the Changes in the Circulation after Birth.*—It is difficult to explain the cause of the first inspiration; by some, it has been attributed to an instinctive movement of the fœtus, from the "*besoin de respirer*" (necessity of respiring) experienced by it, after a separation from the placenta; but these reasons are not satisfactory to me, for the air is only introduced into the lung as a consequence of the enlargement of the cavity of the chest, and not, as some imagine, to fill a vacuum which never existed. Now this expansion of the chest has for its sole cause the violent, jerking, spasmodic contraction of the diaphragm, which is always the result of a suffering condition of the fœtus, caused by the suspension of the utero-placental circulation, the sudden impression of cold, or the different characters of the media to which the child is successively and rapidly subjected. Finally, also, by the artificial excitations (friction on the surface, irritation of the mucous membranes, &c.) resorted to when the infant is feeble.

As soon as the respiration becomes established, the sanguineous current takes another direction; because, on the one hand, the fluid flows towards the lungs in greater quantity; and, on the other, the placental circulation is forcibly interrupted. Below, I subjoin the results of the labors of Billard, who has devoted particular attention to the modifications then observed in the organs of circulation, as they are interesting alike to the accoucheur and the medical jurist.

The fœtal openings are generally obliterated in the course of a week after birth, still, they may remain patulous at that age; and, I may add, that either the foramen of Botal or the arterial canal may continue pervious at two or even three weeks, without the child's experiencing any particular disadvantage therefrom during after-life.

The umbilical arteries are usually closed on the second day; even at twenty-four hours they have already become smaller in the vicinity of the ring, and they are obliterated by the third or fourth day as far as their junction with the hypogastrics, by gradually changing into a fibrous cord; the whole process being completed in three weeks.

The umbilical vein is never obliterated until after the arteries have become impervious, and the same is true of the ductus venosus; however, both are quite empty, and considerably contracted on the fourth day, and they are generally closed up by the sixth or seventh.

The arterial canal and the foramen of Botal are the last to undergo this process; but they rarely persist beyond the eighth or ninth day, although the foramen sometimes remains open much longer, being only effaced completely towards the end of the first year.

If the ductus arteriosus and the umbilical arteries be examined during the progress of obliteration, their parietes will be found to grow gradually thicker; this hypertrophy is particularly observable in the arteries near the navel, as may be easily verified by making sections of them at this point; but the thickness gradually diminishes towards their origin from the iliacs, and their canal is likewise obliterated precisely in the same order of progression. Of course, the contractility of its walls will also contribute towards effecting the occlusion.

The arterial canal undergoes a similar hypertrophy and parietal retraction, which takes place in such a manner that, whilst the absolute size of the vessel does not appear diminished, its orifice is greatly contracted, resembling a pipe whose fracture is quite thick, and opening at its centre of very moderate calibre. The obliteration is therefore the immediate result of the retraction and concentric hypertrophy of the walls; nevertheless, it should not be regarded as the primitive cause, for if the same quantity of blood flowed into those vessels, such a retraction evidently could not take place; but from the very first inspiration, this fluid is driven by the contraction of the right ventricle (see hereafter) almost entirely into the pulmonary arteries, scarcely any of it passing by the ductus arteriosus; and, on the other hand, the very oblique angle at which the umbilical arteries pass off, satisfactorily explains why the blood, that flows into them in such great abundance when it has no other outlet, no longer enters them at all, or at least only very feebly, when the establishment of respiration has completed the vascular circle of the new-born child.

But the umbilical vein and the ductus venosus are not obliterated in this way, and their walls exhibit no remarkable increase of thickness; for, after the cord has been cut, these vessels receive no more blood, excepting in those cases where it regurgitates from the vena cava, and then the walls fall in and become contiguous, just like any other canal, when the liquids that habitually traverse it are cut off; nevertheless, the umbilical vein and the ductus venosus retain their cavities free for a long time, for a large probe may easily be introduced into them; but this cannot be done in the arteries nor in the ductus arteriosus.[1]

The foramen of Botal is the last to disappear, although an effort at obliteration may be observed there sooner than in any other of the fœtal openings: thus, the two auricles are nearly confounded in one in the early stages of intra-uterine life, and the diminution of the foramen ovale only begins to take place about the third month by the development of a semilunar valve on its inferior border. This valve, composed of a double membranous layer, containing fleshy fibres in its substance, gradually rises along the margins of the opening towards the left auricle, by contracting adhesions with the circumference of the foramen, and it ultimately forms the fundus of the fossa ovalis, as also, the little semilunar fold seen in the auricle. In this way the partition is completed, being merely perforated by an oblique canal occasionally found in young subjects, which also disappears after a time.[2]

The following summary will enable the reader to appreciate the influence of these vascular changes upon the circulation.

Immediately after the first inspiration, and from the sole fact of the distention of the pulmonary cells, the branches of the pulmonary artery, ramifying in the mucous membrane, and contributing to the formation of their walls, are suddenly rendered permeable throughout their whole extent, and a vacuum is therefore produced, into which the blood is sent from the right ventricle; consequently, from that period, the route travelled by this fluid, from the right ventricle to the aorta, is much longer than heretofore and the ductus arteriosus, being thus emptied, will retract at once, and have its calibre very much diminished.

---

[1] A case of persistence of the umbilical vein in the adult, which communicated at one extremity with the vena portæ, and at the other with the crural vein through the superficial abdominal veins, is reported by M. Cruveilhier, in the 16th number of his *Pathological Anatomy.*

[2] According to Dr. Tyler Smith, the expansion of the lungs produces a compression of the ductus arteriosus by the left bronchus, and thus assists in its obliteration. The change effected in the position of the heart also aids mechanically the occlusion of the foramen ovale; and finally, the depression of the liver by the respiratory act, closes the umbilical vein by flattening its walls. (*The Lancet*, Sept., 1848.) None of these assertions appear to us sufficiently well proved, and therefore demand further investigation.

The right auricle, which could scarcely force all the blood that it received from the venæ cavæ, through the foramen of Botal, now sends the most of it into the right ventricle.

Prior to birth, the left auricle only received the blood by the foramen ovale, but it is henceforth filled with that brought through the four pulmonary veins. Moreover, the relation that existed, in the quantity of the blood deposited in each auricle, is changed from that time; for the right, which was distended beyond measure, now relieves itself with facility, while the left, that scarcely received any before, is filled with the blood brought by the pulmonary veins; so that it would flow from the left to the right auricle, through the foramen ovale, if the semilunar partition, which acts as a valve, did not prevent such a movement.

[§ 4. INNERVATION.

Most of the encephalic functions remain, according to M. Jacquemier, entirely dormant during intra-uterine life. Sensibility, however, becomes highly developed in the fœtus at quite an early period; in proof of which it is only necessary to press upon the womb through the walls of the abdomen, when the fœtus will be found to move for the purpose of avoiding compression.

A more direct experiment may be made as follows. If the abdomen of a pregnant rabbit be opened, the fœtus will be visible through the transparent walls of the womb, and a foot may be readily caught and compressed by a pair of forceps. When this is done, the fœtus moves in such a manner as to leave no doubt that it feels a certain degree of pain; for its action could not be regarded a merely reflex phenomenon. Spontaneous motions are caused by instinct or a vague and obscure exercise of volition.

During intra-uterine life, therefore, and especially near the end of gestation, innervation is almost as perfect as in the new-born child.

The functions of the fœtal nervous system present, like those of the adult, an intermittent action or periodicity, resembling the waking and sleeping states.

When a new-born child is asleep, if it be awakened and excited briskly several times with the tip of the finger, it will, at the moment of awakening, almost always make some abrupt motions. The same thing takes place, no doubt, during intra-uterine life, so that when we try to produce active movements by compressing the uterus, it is probably aroused from the sleeping to the waking state, and just then the hand on the abdomen becomes conscious of the actions elicited.]

§ 5. SECRETION.

As it is not our intention to treat of all the various secretions which occur in the fœtus, we shall confine our remarks to those of the bile, meconium, and urine.

1. *Secretion of Bile.*—The liver is the most voluminous of all the fœtal organs. At three months its texture is soft and pulpy, not yet having the granular character visible at term; the gall-bladder at that period resembles a white thread, its inferior extremity being the largest, and its cavity exceedingly contracted. At five months the volume of the liver is much greater, the texture more condensed, and the gall-bladder more apparent; the secretion of bile then begins, and continues to augment thereafter

throughout pregnancy. We have just stated what appear to us to be the principal elements of the bile. At the seventh month, the gall-bladder is filled with a yellow secretion, and a considerable quantity of this is also found in the intestinal canal.

2. *Meconium.*—During the early periods of the intra-uterine life, the digestive canal is merely moistened by a little fluid, but a more abundant secretion begins to take place towards the third month. According to Lee, the stomach then contains a clear, acid, and non-albuminous fluid; whilst at the upper part of the small intestine a substance similar to chyme is found, consisting of pure albumen, and there is an analogous albuminous liquid in the biliary duct. The meconium exists in the small intestine only, prior to the fifth month, and is of a greenish-brown color, but after that period it reaches the large intestine, becomes of a darker hue, and finally accumulates in the rectum. This fluid is a mixture of bile with the products secreted by the intestinal mucous membrane.

3. *Urine.*—The urine never fills the bladder entirely in the human embryo; now, as the kidneys are developed early, and their secretion commences at once, the urine must certainly be evacuated by some outlet. On this account, certain embryologists have supposed that the bladder communicated originally with the allantois by means of the urachus, and that the cavity of this membrane was the ultimate reservoir of the urine. However, this is not the generally received opinion, for, as we have elsewhere proved, the allantois ceases to exist in the human species as a distinct vesicle long before the development of the kidneys; and the urine must therefore be expelled through the urethra into the amniotic cavity.

That its evacuation is necessary is proved by the facts already cited, in which the existence of an imperforate urethra led to extreme distention and even rupture of the bladder.

CHAPTER VI.

DIAGNOSIS OF PREGNANCY.

THE signs of pregnancy are divided into the rational and the sensible.

The first comprise all those characters pointed out by authors as existing in the earliest periods, by which they assert a conception may be justly suspected; then in the subsequent stages,—the suppression of the menses, the enlargement of the abdomen, the pouting of the navel, the phenomena just studied in the breasts, the symptoms, or rather the functional disturbances in the digestive organs, the condition of the pulse, the modifications in the urine, and lastly, certain changes that occur in the woman's habits, as well as in her moral and intellectual faculties.

§ 1. RATIONAL SIGNS.

According to Aristotle, there is some ground for believing the woman has conceived, if no fluid oozes out from the vagina after coition, and if the penis is unusually dry when withdrawn; and the opinion seems to be universally received by shepherds, that the retention of the semen is an evidence of impregnation. Agreeably to Hippocrates, the eyes become more sunken, more languishing, and are surrounded by a bluish circle, and spots of different sizes appear on the face. Again, since the days of Democritus, a swelling of the neck is also enumerated as a sign of conception. However, all these symptoms have but little, if any value, and I accord far greater importance to the more voluptuous sensation, the more general erethism experienced by some females during a prolific coition, by which a few of them can recognize with a degree of certainty that they have become pregnant.

1. *Suppression of the Menses.*—Females cease to be regular during pregnancy; and this is a law of such general truth, that whenever it occurs in a healthy woman, without a known cause, and not attended with, or followed by any morbid symptom, it is justly regarded as a probable sign of gestation; but as this suppression might be produced by a number of other causes, whenever a physician is consulted about it, he ought carefully to inquire into all the circumstances, past or present, which may have produced such an effect. It would be out of place now to enter into this diagnosis, but we may reiterate an observation, already made by several authors, and which our experience has frequently verified, namely, that in some young married women, who had hitherto been quite regular, the menses become at once suppressed, and continue so for several months, without any known cause; and this suppression, resulting probably from the irritation or derangement produced in the genital organs by the first conjugal approaches, is frequently accompanied by an augmented volume of the abdomen, and a more exalted sensibility of the mammary glands; and, as the mind so readily believes what it most ardently desires, nothing more than this is wanted to found a hope of a commencing pregnancy. Hence the physician must exercise great discretion in his diagnosis, when consulted on so delicate a subject.

The menses may continue during pregnancy; thus they frequently appear in the earlier months, more rarely during the first five or six months, and what is still more unusual by far, they may exist during the whole period of gestation.

Numberless observations of this kind, recorded by authors, prove the truth of these assertions, and we also can bear testimony to the same point; thus, we saw some females in 1837–38, who were evidently pregnant, and in whom the menses flowed at the usual periods, and lasted for the same number of days; one of them assured us that she menstruated during the first five months, and that her courses appeared on the second of each month, and lasted for two days, just as she had them previously. Again, two females came under my observation at the Hôtel Dieu, whose cases have been already published in my thesis, who were regular throughout the whole term of pregnancy. Dunal (of Montpellier), Haller, and Mauriceau likewise cite similar cases; but notwithstanding all this, some accoucheurs still deny that women can be regular whilst pregnant.

M. Moreau, who professes this belief, has, however, often known females to have sanguineous discharges at variable periods during gestation, but the irregularity of their appearance, the qualities of the blood itself, and the greatness or smallness of its amount, serve to distinguish these, in his estimation, from a true menstrual discharge. The remark of M. Moreau is certainly applicable to many cases, but the instances above cited, and numbers of others that might be quoted from various writers, do not permit me to entertain a doubt that a woman may menstruate during pregnancy.

On the other hand, females may become pregnant without ever having had their menses;[1] and the same is true of some others in whom they are suppressed either by accident, from the progress of age, or in consequence of nursing.[2]

All those anomalies will be understood without difficulty, if we do but recollect that, although the appearance of the menses is always connected with the ovarian evolution, the latter may take place without being accompanied by the menstrual flow. (See *Menstruation.*)

Deventer, Baudelocque, and Chambon furnish accounts of women who were regular only during gestation; the case cited by Deventer is particularly curious, from the opportunity he had of observing this fact in four successive pregnancies of the same woman. Finally, Desormeaux believes from his observations, that in certain years, and often without any apparent cause, a greater number of women have their menses during gestation, even where they were completely suppressed during former pregnancies. Does this result, as he appears to think, from atmospheric influence, or is it pure chance? For my part, I am unable to decide the question.

Though it is important to be aware of these exceptional cases, it is equally necessary to guard against the general tendency to a belief of the marvellous. It should not be forgotten, that the continuance of the menses during pregnancy is of rare occurrence, and that, although their suppression is of great value as a point of diagnosis, it may nevertheless be the result of a variety of causes.

---

[1] A young woman presented all the signs of pregnancy, and although she had never menstruated previous to that period, her courses then appeared and continued during the whole of gestation. (Perfect, *Cases of Midwifery*, vol. ii. p. 71.)

A lady, aged twenty-four years, during eight of which she had been married, was never regular except during pregnancy, and each appearance of her menses proved to be a certain sign of that condition.

A woman, who married at twenty-one, had never been regular; two years afterwards she experienced some gastric distress, and the flow appeared. Nine months subsequently, she was delivered of a healthy child, notwithstanding the menses did not fail to appear every month. (Churchill, *Observ. on the Diseases of Pregnancy*, p. 36.)

[2] Dr. Flechner, of Vienna, relates that a young woman of twenty-two, had always been regular, but the menses never reappeared after the first accouchement, being replaced each month by an intense headache, accompanied with a feeling of oppression and heat in the forehead and parietal regions. During the succeeding thirteen years, she gave birth to six healthy children. (*Gaz. Méd.*, p. 91, 1841.)

Dewees states, that a woman who had been married for several months, suffered some gastric distress. She had never been regular but three times, and for a number of years there was a complete suppression. He directed rhubarb pills, which purged her slightly, but did not relieve her; six months afterwards, the abdomen being somewhat enlarged, he was enabled to ascertain that she was six months advanced in pregnancy; and soon after the menses returned, and continued regularly until term. During lactation, which lasted a year, the courses did not appear; she then weaned the child, and in a short period again became regular, and this, like the former, was the announcement of a new pregnancy.

2. *Enlargement of the Abdomen.*—An increase in the size of the abdomen may be produced by so many different causes that its slight value as a sign will be readily foreseen. There is, however, something peculiar in its shape and mode of development in gestation. Thus the abdomen swells somewhat in the first month, but this is owing to a collection of gas in the intestinal cavity, which, after remaining a few weeks, diminishes and disappears, whence the woman often seems smaller at the end of the second month than during the first; but whenever this slight tympanitis is not manifested, the abdomen is flatter the first month than before, probably because the uterus settles down in the excavation. At the beginning of the third month, or at three months and a half, the hypogastric region evidently becomes more salient, and the enlargement is thenceforth regular and always increasing until term. Consequently, the tumefaction begins to show itself just above the symphysis pubis, being more considerable at first on the median line than elsewhere, while the sides appear flattened; after the fourth month, the upper extremity of the uterine tumor may be clearly perceived through the abdominal wall, especially in thin subjects, by placing the woman on her back and the abdominal muscles in a state of relaxation; but if the parietes be thick and tense, palpation, practised in the manner hereafter described, will become necessary to ascertain this point.

The modifications in the size of the abdomen, at different periods of gestation, have already been described; but its development is not always regular, being, for instance, much more rapid in twin pregnancies, and in dropsies of the amnios than in other cases. Besides, the relation between the volume of the abdomen and the stage of pregnancy, is not always maintained; thus, some women are no larger at seven or eight months than others are at five, owing either to their high stature, their breadth of pelvis, or the small degree of projection in the vertebral column and upper part of the sacrum. On the contrary, in small women, more especially in those having a contracted pelvis, and in whom the womb is therefore necessarily raised, during the early months, above the superior strait, the abdominal protuberance is premature, if I may so express it, and is much better marked at quite an early period than ordinary.

The *umbilical depression* at first appears deeper, its bottom seeming to be drawn downward and backward in consequence of a tension of the urachus, occasioned by the fundus of the bladder following the descent of the uterus in the excavation. The circumference of the ring becomes at the same time the seat of a distressing dragging sensation, and is more sensitive to pressure; and this sensibility is sometimes extended over a considerable portion of the abdominal wall. But about the end of the third month, that is, as soon as the uterus gets above the superior strait, the umbilicus resumes its normal condition; at the fourth month, it is less hollow than before conception—then its bottom becomes more and more superficial during the fifth and the sixth, and the whole depression is effaced, and is found on the same level as the skin by the seventh month, and in some cases, the umbilical ring is sufficiently dilated to receive the end of a finger; finally, in the last two months, the navel forms a protuberance. Not unfrequently, small portions of the epiploon become engaged in the ring during the exertions of the female and project externally.

These changes in the umbilicus afford a rational sign of great value, because they are almost constant. I say almost, for in a case observed by M. Blot, there existed a depression three-eighths of an inch in depth, the woman being at term and of ordinary embonpoint. Though these alterations of the umbilical depression may be produced by a pathological tumor of considerable size, or by an accumulation of fluid in the peritoneum, it is equally true, that they almost always exist in advanced pregnancy, and that their absence is, in a majority of cases, conclusive against the existence of a fœtus of seven or eight months.

3. The presence of the streaks, and especially of the brown line, which extends, as we have stated, between the pubis and umbilicus, is very important to the diagnosis, especially in a primiparous female. The streaks, however, may be present whenever the abdomen has suffered great distention from any cause whatever.

4. The phenomena presented by the mammæ afford, in the opinion of Mr. Montgomery, a *certain* sign of pregnancy. Smellie and Hunter also considered the changes in the areola as a positive evidence of this condition. The latter surgeon, indeed, did not hesitate on one occasion, when examining a dead body, to declare from this sole indication, the uterus to be enlarged by the product of conception; as the examination proceeded the hymen was found intact, but even this did not change his opinion, and when the womb was opened its correctness was fully confirmed. This fact, with many others which might be cited, prove the value of these signs when they exist, which unfortunately is not always the case; any one of them, indeed, may be wanting, and sometimes they are totally absent. Thus, in 1837, I saw a strong and vigorous young brunette at *La Clinique*, who had advanced to the end of gestation, without any of the indicated marks appearing around the nipple; and I have since made the same observation on several different occasions. Their absence is not therefore an absolute proof of the non-existence of pregnancy, so that their importance in this respect has been exaggerated by some English surgeons. These cases, however, are rare, and I should diagnosticate as almost certain the existence of pregnancy in a young woman who had never borne children, and whose breasts presented both a brownish-colored areola, the tubercles, and the freckled characters before described. But in those who have had children, it is very difficult to determine whether these signs result from the modifications of the breast in former pregnancies, or from a new conception. In such cases we have only the testimony of the women themselves to rely on, and this more especially, if but a short time has elapsed between the last and the present gestation.

[We have examined a young woman in whom both vagina and uterus were absent, although the external genital parts were well formed. Pregnancy in such a case is evidently impossible, yet here the true areola was of a very dark color, and the dotted one very decided. Still, the deepened color of the breasts, when well marked, is a good rational sign, though its absence is far from disproving the existence of pregnancy. In brunettes, the true areola almost always darkens as the dotted one forms. Such, however, is not the case with blondes, in whom the color of the breasts is far less decided, and in women of a ruddy complexion it is generally absent even at the end of gestation.]

5. I have never been able to appreciate the reputed value of the signs founded on the state of the pulse of pregnant women, for although it has always seemed more developed, fuller, and harder, I could discover nothing further concerning it.

6. The disorders of digestion, as well as of the moral and intellectual faculties, are of but secondary diagnostic importance; they can do little more than direct the attention of the possibility of a doubtful pregnancy, but as they belong more properly to the pathology of gestation, they will be studied hereafter.

7. *Alterations of the Urine.*—Having treated at length of the production of Kyesteine in the urine of pregnant women, we merely state here that its presence is not as certainly diagnostic as some authors have supposed. Yet its existence in the urine of an otherwise healthy woman is an important rational sign.

Finally, it will be perceived that no one of the rational signs whose diagnostic value has just been discussed is conclusive, when taken singly; excepting, however, the changes undergone by the breasts, which, if well marked in a primiparous female, may of themselves remove all doubts as to pregnancy.

But although, singly, these various signs may only give rise to doubts, their union furnishes a sum of probabilities nearly equivalent to certainty, a certainty which, however, could never be complete until after a determination of the sensible signs, which we shall next proceed to examine.

§ 2. SENSIBLE SIGNS.

All the sensible signs of pregnancy are derived either from auscultation or the touch. Hence, we must carefully study these two means of exploration, as well as the results which they furnish.

A. *Of the Touch.*—The *touch*, considered in an obstetrical sense, is the art of ascertaining the condition of the various hard and soft parts in the female, which contribute to the great act of reproduction; and it consists in the exploration of those parts by aid of the finger and hand applied to the vulva, vagina, and rectum, or upon the abdomen.

The touch is practised under various circumstances, for the purpose of ascertaining the existence and stage of the gestation; the imminence of an approaching accouchement; the progress of the travail; the presentation and position of the fœtus; the nature and energy, or the feebleness of the contractions; and the character, volume, and situation of obstacles presented by the hard or soft parts, which might prevent the spontaneous termination of labor, and demand the resources of art. The fact that any moment in the life of the accoucheur may call for its exercise, is of itself an evidence of its great importance, and of the necessity for practising it. With some experience, any one, whatever be the shape or size of his finger, may acquire such a degree of skill in the touch as will bear him through the most difficult cases in practice.

Let no student, therefore, be disheartened by the difficulties met at the commencement, or by the groundless fears of too short a finger, for *this becomes longer by exercising the touch;* and those pedants are unworthy of credence, who seize a hand, and after examining it gravely, reject it with disdain, exclaiming, "You will never be an accoucheur with such a hand as that." Women, generally, have shorter fingers than ourselves, yet they become very perfect in the touch; and I repeat, that, unless there is a malformation of the hand or fingers, anybody may learn by practice to touch, and to touch well.

1. *Vaginal Touch.*—The index-finger is usually employed for this purpose; after being extended, it is entered horizontally in the fissure between the nates, until arrested by the soft parts, and the index is then drawn forwards, as far as the opening of the vulva. I prefer this method to the one in which the finger is carried from before backwards, in such a manner as to pass over the clitoris and the meatus urinarius, because friction against these parts should always be avoided with the greatest care. In bringing the finger from behind forwards, it would not be possible, except through gross negligence, to confound the anal orifice with the vaginal opening, and this being once found, the index is first pressed almost directly backwards, until one-third of it has penetrated into the vagina, and then by strongly depressing the wrist, the operator gives his finger a nearly vertical direction, so that the thumb may be applied against the anterior face of the symphysis, the radial border of the index be directed in front, and its cubital border be placed against the anterior perineal commissure, which it serves to push backwards. The other three fingers vary in position, according to the case, and more especially to the object in view; for example, if desirable to explore the parts situated on the posterior plane of the excavation with the index, it is better, in my opinion, to extend them on the perineum, pressing the latter up by the radial border of the medius; but if, on the other hand, we wish to perform the ballottement, or to explore the parts on the anterior plane, it will be more convenient to flex the thumb and the other three fingers into the palm, the index alone being extended, with its palmar portion directed in front. Stein directs the medius to be joined with the forefinger, but this is generally useless, and often inconvenient, for although the two fingers may possibly penetrate a little deeper, the sensation is not so clear as that obtained by one.

Physicians should accustom themselves to touching with both hands, for there are some diseases of women, and some positions of the fœtus, which compel the accoucheur to use the left hand. Or, it may also happen that a wound upon the right will necessarily require the left to be substituted, though for all ordinary purposes the right is sufficient.

The woman should be placed either in the erect, or the recumbent position during the examination, according to circumstances. In the commencement of pregnancy, it is better, as a general rule, to have her lying down; because, in this position, the head being propped up, and the inferior extremities flexed and separated, the abdominal muscles are thrown into a state of relaxation, and thus the development of the uterus can more easily be determined. Again, such diseases as prevent the female from standing erect, may also require the same posture. But at a more advanced period, either position may be used indifferently, though most frequently the ballottement can be accomplished better while the woman is standing. In this latter case, her loins should lean against a wall or some piece of furniture; a chair must be placed at each side for her hands to rest upon, and the upper part of her body is to be slightly flexed forward.

Where any difficulties are encountered in the exploration, it is advisable to touch in both positions.

Before operating, the accoucheur should anoint his finger with some unctuous substance, fat, butter, oil, mucilage, &c., for the double object of rendering the introduction easier and less painful to the woman, and to protect himself from the contagion of any disease she may be affected with.

When the female is standing, he should place himself before her, resting on one knee—in my opinion, it is not wholly immaterial which—for, as a general rule, the knee opposite to the operating hand is preferable, because the other one will then furnish a point of support for the elbow to lean upon; though, if the woman be very short, it would be better to flex the right knee, if the right hand is used.

When the patient is recumbent, the accoucheur places himself at her side, the right one, if he intends using the right hand, and on the left, if the other is to be employed. One hand is then placed upon the abdomen, while the other is engaged in the vaginal exploration; and this precaution is especially advisable, when the ballottement is practised, in order to fix the fundus uteri, and keep it steady. In passing the finger over the perineum, and before entering the vagina, we ascertain the presence or absence of the fourchette, or the inequalities that supply its place after a labor; and as the index enters the vagina, it should examine the condition of the external labia, the length and width of the vagina, its mucous membrane, whether smooth or rugous, the various diseases, tumors, or degenerations that may exist on the surface or in the substance of its walls, and the condition of the rectum, whether full or otherwise. Hereafter, we shall have occasion to speak of this process as a means of diagnosis in the various vices of conformation.

All these explorations being made, the next step is to examine the neck of the uterus, and learn its modifications in form, consistence, situation, direction, and in the dimensions of its cavity; all which have been carefully described. (See page 130, et seq.) The finger may detect the development of the body of the uterus, by ascertaining the spreading out of its inferior part. Until toward the third month, the organ is almost wholly within the excavation, it having at that early period increased so much in size as to occupy almost all the true pelvis. Its mobility is, however, very slight, in consequence of its restrained position, whilst in the ordinary unimpregnated state, it may be carried to the right or left, forward or backward, by simply pressing with the finger on the side of the neck. The restraint of the body during pregnancy renders the neck immovable, so that it becomes impossible, or at least very difficult, to produce such motions; the uterus will also be found much heavier if any attempt be made to raise it.

2. *The Anal Examination.*—The accoucheur is very seldom obliged to introduce his finger into the rectum, but still a partial obliteration of the vagina may render such an exploration necessary; it might also be useful where there were reasons for supposing a young girl to be pregnant, who insisted upon her virginity. For the necessity of sparing the hymen, which *may possibly be intact*, renders the vaginal touch very difficult. In cases where a tumor exists at the posterior part of the vagina, it is sometimes difficult to decide whether the enlargement is located in the recto-vaginal septum, or is attached to the bony structure. Here the diagnosis is very important, for the course to be pursued in the two cases would be widely different, and all doubt may be removed at once by introducing the index into the rectum, and the thumb into the vagina.

I can recall but a few other circumstances where an accoucheur would feel obliged to resort to the anal examination, although I am well aware that it is frequently recommended for certain cases of doubtful diagnosis in the earlier months; but most women are so shocked by this mode of examination, that, in truth, they are unwilling to submit to it, unless from motives of strong interest or necessity.

B. *The Passive Movements, or Ballottement.*—This, according to most authors, is a sensation analogous to that produced by placing a ball of marble in a bladder full of water, and then striking the bladder with the finger just under the spot where the ball rests, when the latter is thrown up, and falls back from its own weight upon the finger which displaced it. This comparison, however, only holds good at a certain period of gestation, and we shall again take occasion to refer more particularly to this point. To perform the ballottement, M. Velpeau directs the index finger of one hand to be placed under the cervix, and the palmar face of the other hand over the fundus uteri; then, by a sudden movement of the finger in the vagina, the uterus is to be pushed upwards; being movable, free, and the only solid body in the amniotic liquid, the fœtus ascends, strikes the point diametrically opposite, and falls back upon the finger which gave it the impulse.

But as this mode will not, I believe, afford any satisfactory results in the majority of cases, I recommend students to pursue the following plan in performing the operation: the vaginal finger should *not* be placed under the cervix, because it will then be separated from the fœtus by the whole length of the neck, and of course the finger cannot recognize so clearly the descent of the displaced body; but rather in front of, or behind the neck (according to the woman's position), upon the walls of the *body itself*, for then the index is only removed from the substance to be examined by the very thin walls at the inferior region of the uterus, and it detects very readily the least motion of the inclosed fœtus.

If the woman is standing, the index should be introduced in a vertical position, with its palmar face turned forward, and the other three fingers flexed into the palm, and as the symphysis pubis scarcely exceeds an inch and a half in length, the digital extremity of the forefinger easily passes its superior part, and reaches the body of the organ, where it almost always encounters a hard globular tumor formed by the head of the fœtus; then a light, quick blow is to be given by it, after which the finger must remain immovable on the part struck. This shock should be made in a direction from below upwards and from behind forwards, by suddenly flexing the first phalanx. This last recommendation I deem very important; for in the great majority of cases, the uterus is inclined forwards, its long diameter, like that of the fœtus, corresponding very nearly to the axis of the superior strait. Now if, under these circumstances, the shock be communicated to the presenting part of the child from below upwards, and from before backwards, as generally done, it is evident that the motion given to it will, at furthest, be but a slight movement of displacement or jolting, but never one of ascension, which in fact would be impossible, because by the direction of the blow the fœtus is pushed against the posterior uterine wall, and not along the axis of its cavity.

The ballottement may also be effected when the woman is recumbent, by acting in the manner I have just indicated, but it is then generally necessary to place the finger upon a point somewhat nearer to the neck, sometimes before, but at others behind it. The erect position, however, is usually the more favorable for the perception of the ballottement, and therefore preferable.

It sometimes happens, about the fifth month of gestation, that if the woman be standing, the vaginal touch does not afford the sensation of ballottement; but if she be directed to lie down, and the vaginal finger be applied upon the uterine wall, whilst the body of the womb is forcibly depressed by the other hand placed near the umbilicus, the vaginal finger is struck by some part or other of the fœtus, which is displaced by the external pressure.

At an early period of pregnancy, it is sometimes possible to perceive the ballottement by simply feeling the abdomen. If the woman be placed on her side, in a horizontal position, the fœtus, in obedience to gravity, descends to the lowest points. If the hand be then glided beneath the side of the abdomen which touches the bed, some part of the fœtus will be distinguished and may be readily displaced, but soon returns to its original situation.

This sign usually becomes valuable about the fourth month, for before that period the fœtus is generally too small, and, possibly, the uterine walls are too thick. Again, it varies much after that time: for instance, our search is not always successful in the fifth month, the small size of the child permitting it to change position very easily; on one day it is found without difficulty, and on the following it defies all efforts at detection.

Towards the seventh month, the ballottement is in general the most clearly recognized, since it is at this period, especially, that the finger perceives the solid mass, inclosed and swimming in a liquid, to rise up and shortly afterwards to fall back upon it; but the sensation is no longer perceptible at the end of the eighth or the beginning of the ninth month, unless there happens to be an unusual amount of water, for then the fœtus has become too large. The finger can indeed raise it, but the friction against the walls of the uterus almost destroys the tendency to ascend. The mobility of the tumor is readily detected, but it now leaves the finger which impels it; it is a displacement in mass rather than ballottement. Finally, in the latter periods of gestation, the head pushing the uterine wall before it, engages in the superior strait, sometimes even gets low down in the excavation, thus becoming jammed in, as it were, and of course the ballottement is then altogether impossible.

Writers declare this sign to be a certain indication of pregnancy; but the proposition is, perhaps, somewhat too absolute: for example, it is possible for a stone resting in the bas-fond of the bladder to lead to an error, and I once met with a case which might readily cause a mistake of this kind. During the time I acted at the obstetrical clinic, as *chef de clinique*, a woman was subjected to the touch, who declared herself pregnant, and advanced three or four months; at first, I examined her in the recumbent position, and found all the negative signs of gestation, but one of my advanced pupils then performed the same manipulation in the standing posture, and declared that he perceived the ballottement, when I re-examined her, and found the following condition of things: The neck was strongly pushed backwards and a little to the left; it was slightly softened, and sufficiently patulous to admit the extremity of the finger. (This woman afterwards acknowledged she was delivered only four months previously.) As the finger left the cervix, and advanced just behind the symphysis pubis, it encountered a large resisting surface, which was evidently the body of the organ, and then, by giving a slight blow, a movable body was felt there, which immediately fell back upon the finger, exactly as the fœtus would in the fourth month. I confess that at first I believed her pregnant, and retouching her in the recumbent state, I once more remarked the negative signs, but my finger could not now detect the substance that had been so easily moved when she was standing. At the third examination, I discovered an anteversion of the womb, so complete that its anterior face had become inferior or horizontal, and it was over nearly the whole extent of this face the finger had passed in examining; and further, I found that the fundus uteri, situated behind the symphysis pubis, was the light movable body which had produced the sensation of ballottement.

If a similar case should occur again, it might give rise to uncertainty in diagnosis, and on that account I concluded to make it public through this work.

There are also some particular positions of the fœtus in which the ballottement would be of little service: for instance, in those of the breech it is generally very difficult, and nearly impossible in those of the trunk. In two cases, however, I succeeded in detecting a small part, which, from its diminished size, must have been an elbow, wrist, or heel; and this, together with the other signs, satisfied me that it was a position of the trunk. M. Hatin, who attended one of these women in her accouchement, found a presentation of the left shoulder; the other was delivered at the Clinique, and like the first, verified my diagnosis.

2. *Palpation of the Abdomen.*—An exploration of the abdomen, says Schmitt, is of great importance in diagnosis, and should always be resorted to when it is desirable to ascertain whether pregnancy exists. It is often, indeed, more instructive, and furnishes surer results, than the internal examination.

Some obstacles are, however, met with in this mode of research. Thus:

Hitherto we have only demonstrated that the uterus is developed; but the question arises, what is the cause of that development? The solution is nearly always difficult; we may state, however, that when the womb is enlarged by a product of conception, its walls are generally more flexible than if the enlargement were dependent upon some chronic disease; and that, after a little practice, this suppleness can be detected by carrying the finger to the posterior surface of the body, which may be done in consequence of the depression and retroversion of the fundus. The uterine wall then offers about the same resistance as an œdematous limb, or perhaps still nearer, that of caoutchouc when slightly softened in hot water.

The tumor detected either by the vaginal touch, or by depressing the ventral parietes, is rounded and smooth throughout, and does not present any of those irregularities observed in cancerous or fibrous degenerations of its walls; and this fact, together with the preceding observation, will serve to distinguish a morbid state from a true gestation.

It certainly will not prove quite so easy to determine whether the enlargement is caused by a fœtus, or the presence of a mole in the cavity; in fact, I do not believe this diagnosis is possible, except at a very advanced stage, and then the absence of the fœtal inequalities, the non-appearance of its movements, auscultation, &c., might suffice to remove the doubts on the subject.

In some women, the womb becomes congested and considerably tumefied at the menstrual periods. Now this state may readily be confounded with a commencing pregnancy, the more particularly, because at those epochs the neck usually becomes softer and dilates a little; and I know no way of escaping this error, if the woman insists that she is pregnant, and experiences the various rational signs of that condition. In two cases of the kind I have met with, I only succeeded in detecting the falsity of my diagnosis by examining the woman a second time, two or three weeks after; for these females, who were used as subjects for practising the touch at the Clinique, wished to be considered pregnant; but, unhappily for them, the fortune which aided in the first examination, deserted them at the second; for, being ignorant of the cause of my mistake, they returned at a time still more distant from their menstrual period.

On the whole, then, there is no certain sign of pregnancy during the first three or four months; yet it becomes almost certain, when the sensible signs above indicated coincide with the presence of the rational ones, in a healthy woman who can have no intention of deceiving us as to her condition; still, in a medico-legal case, the physician should express his doubts, and demand a new examination at a more advanced period. But if it is not always possible at the beginning of a gestation to prove that it does exist, we can, at least in the great majority of cases, satisfy ourselves positively that it does not; for most frequently the unimpregnated state of the organ can be readily made out.

3. *Active Movements of the Fœtus.*—The existence of pregnancy is announced during the last five months by certain signs that are far more reliable than any of those hitherto mentioned; these are the fœtal movements, which have improperly been called the *active* and *passive*, but better

designated by M. Stoltz as the movements *proper* and the *communicated* ones. We have already studied the communicated ones in treating of ballottement and palpation of the abdomen; so that it only remains to describe the active movements.

The woman generally perceives the fœtal movements at about four months and a half, although the muscles of the infant had contracted long ere this, unconsciously to her; for every accoucheur must have detected these motions by placing his hand upon the abdomen, at a time when the mother herself still doubted her own pregnancy. Now these movements are excessively feeble at first, and produce a kind of tickling, or rather a sensation analogous to that of the crawling of a spider; they gradually become more characteristic, and may then be classified in two species. One of these is produced by the movements of the whole trunk, or some of its parts, the first of which are recognized by a quivering that is perceptible to the female, while the partial motions give rise to quite large projections, which are even visible through the abdominal walls; the other, on the contrary, are blows, certain small, short strokes, which at times are violent enough to elicit cries from the sufferer, and these shocks are evidently produced by the action of the thoracic or inferior extremities of the child. Such movements, so distinct and clear to the mother, would seem to be an infallible sign of gestation, and yet such is by no means the case, since it is not at all uncommon to find women, whose veracity is beyond question, asserting that they have felt them for a long period, and sometimes the motions have even been perceived by the husband or other persons, yet without their being pregnant.

The history of one of the English queens is well known, who, believing she had felt the motions of a child, dispatched couriers with the happy news to all the foreign courts, but proved to be only the commencement of a dropsy! Such errors are frequent, and there are but few accoucheurs who have not met with many of them in practice. Consequently, the physician should not rely in this matter upon the statement of the woman, but should perceive them for himself before hazarding an opinion. It would seem, indeed, that in some cases, the intestinal movements, the rapid passage of gas in the intestines, certain partial and irregular contractions of the abdominal muscles, and the pulsation of a large artery, especially when situated behind any tumor which it raises at every beat, have often deceived not only the patient, but even her medical attendant.

Some females, from the desire of simulating pregnancy, have acquired the power of contracting their abdominal muscles in so singular a manner, that many able accoucheurs have been deceived, and believing that they felt the fœtal movements, have consequently pronounced them pregnant. (Montgomery, p. 84.)

These motions may be detected by the vaginal touch in certain positions of the breech, or even of the trunk, but we must rely chiefly on the abdominal palpation for their detection. In general, it is only necessary to place the hand flat on the abdomen, or to make use of slight pressure, to perceive them; though if they are feeble and infrequent, it is better to dip the hand in some very cold liquid, and then place it suddenly upon the skin. This rapid change in the temperature of the abdomen probably reacts upon the

1, the walls of the abdomen may be too thick; 2, its muscles may be very tense; 3, the bladder may be greatly distended with urine, and the intestines with gas or fecal matter; 4, lastly, a fixed pain in the hypogastric region, rendering any pressure there often insupportable to the patient.

The too great thickness of the walls of the abdomen is the only one of these difficulties which is permanent, but which, nevertheless, frequently renders the palpation of the abdomen entirely fruitless; for as the tension and sensibility of the walls are but temporary, the exploration may be deferred to a more favorable opportunity, and the bladder and rectum may always be evacuated beforehand.

These obstacles are of rare occurrence, the examination being generally quite easy, owing to the flexibility of the walls of the abdomen.

In order to practise it, the female must lie down in such a way that her hips shall be elevated, the head flexed on the chest, and the thighs on the abdomen; in a word, so as to relax the abdominal muscles completely. Whilst in this position, the abdomen should be first examined with both hands, so as to ascertain its form, size, tension, resistance, and hardness, especially in the sub-umbilical region. In the earlier months of gestation, if the parietes are not too thick, a round tumor, of fleshy consistence, can be detected rising out of the pelvis, sometimes in the middle, and at others a little towards the right or the left side; during the first two months it seems to rise higher above the pubis than in the course of the third, which fact is readily accounted for by the sinking down of the organ, occasioned by its increasing weight and volume. This tumor, which is the womb, rises gradually toward the epigastrium as gestation progresses, and it often becomes necessary, in order to form some idea of the time at which labor will probably occur, to ascertain the exact amount of its elevation. The following is, I think, the best mode of accomplishing this object: Place the ends of the eight fingers immediately above the symphysis, and then continue to ascend gradually so long as they feel any resistance, for when the fundus uteri is gained, the resistance suddenly ceases, and the fingers sink deeper as they glide over the convexity, which is thus recognized without difficulty.

The uterine tumor, which is at first quite resisting, becomes less so as gestation advances; sometimes, however, it is so soft as to be barely distinguishable. An attentive examination will enable us to detect the following characters: 1. It always remains circumscribed and retains its oval form; 2. It presents a certain amount of elasticity, similar to that of a cyst filled with serum; 3. If this manual exploration be continued in the same direction, the examiner will detect greater or lesser parts of a single irregular mass, which are movable and easily displaced like bodies suspended in water. Often, indeed, these movable parts may be recognized as belonging to the fœtus.

As a part of the abdominal exploration should also be reckoned the sign furnished by percussion, namely, a dull sound over every part of the abdomen occupied by the developed uterus, instead of the resonance perceived at other points.

Some care is necessary in percussing, during the first four or five months, not to be misled by the dulness which a distended bladder, or a pathological tumor of considerable size might produce. It should also be borne in mind, that although the uterus may have risen to near the umbilicus, a clear sound will be yielded on percussion throughout the greater part of the sub-umbilical region, provided a few folds of intestine be interposed between the walls of the abdomen and the womb.

Sometimes the uterus is above the superior strait in the earliest months. I had an opportunity of observing a case of the kind at the Clinic, with Professor Dubois, in a woman who was advanced six weeks or two months; the uterus was so elevated, being found in the right iliac fossa, that at first we doubted the existence of pregnancy, which however was real, as was proved more positively several weeks after, and fully justified by the event of the case.

The palpation of the abdomen and the vaginal touch are in most cases practised simultaneously; we shall, therefore, point out the signs which this joint investigation furnishes at the different periods of pregnancy.

In the first three or four months the uterus either remains wholly within the lesser pelvis, or else its fundus projects somewhat above the superior strait. In the first case, it will he easily discovered by the vaginal touch that the entire excavation is occupied by a slightly movable tumor, with a smooth and regular external surface. In the second case, the lower half of the lesser pelvis is empty, but the examination of the abdomen, conducted according to the rules above mentioned, discovers the tumor formed by the womb in the hypogastrium. The first point to be ascertained is the exact size of the uterus, and this can only be determined by the double exploration spoken of: the finger having been introduced into the vagina, is applied directly on the neck, or, still better, against the anterior or posterior portion of the inferior segment of the uterus, while the other hand placed above the pubis, presses down the muscular walls, and searches for the tumor formed by the fundus uteri; the womb is thus included between the finger in the vagina and the hand on the hypogastrium, and, of course, the volume of the organ may be thus ascertained, and a comparison made between it and the unimpregnated uterus. Moreover, its displacement in mass can be very easily recognized in this position. To accomplish this, the finger should remain applied as above stated, and when the hand slightly depresses the fundus, the finger in the vagina recognizes the depression; and the counter-proof may be made by endeavoring to raise the uterus from below, by pressing strongly on the inferior part, which is found deep in the excavation.

But the tumor which is felt in the lesser pelvis, or in the hypogastric region, may be either formed by the uterus, or developed in the adjacent parts. In the latter case, the womb will generally found to be displaced, and pressed by the tumor against one of the sides of the pelvis; and if the neck be traced from below upwards, the finger will detect a line of demarcation between the wall of the uterus and the pathological tumor; sometimes, it can even be insinuated between them. The motions to which the neck is subjected are not usually communicated to the tumor, and *vice versa*. Finally, the neck will exhibit none of the changes peculiar to pregnancy.

Hitherto we have only demonstrated that the uterus is developed; but the question arises, what is the cause of that development? The solution is nearly always difficult; we may state, however, that when the womb is enlarged by a product of conception, its walls are generally more flexible than if the enlargement were dependent upon some chronic disease; and that, after a little practice, this suppleness can be detected by carrying the finger to the posterior surface of the body, which may be done in consequence of the depression and retroversion of the fundus. The uterine wall then offers about the same resistance as an œdematous limb, or perhaps still nearer, that of caoutchouc when slightly softened in hot water.

The tumor detected either by the vaginal touch, or by depressing the ventral parietes, is rounded and smooth throughout, and does not present any of those irregularities observed in cancerous or fibrous degenerations of its walls; and this fact, together with the preceding observation, will serve to distinguish a morbid state from a true gestation.

It certainly will not prove quite so easy to determine whether the enlargement is caused by a fœtus, or the presence of a mole in the cavity; in fact, I do not believe this diagnosis is possible, except at a very advanced stage, and then the absence of the fœtal inequalities, the non-appearance of its movements, auscultation, &c., might suffice to remove the doubts on the subject.

In some women, the womb becomes congested and considerably tumefied at the menstrual periods. Now this state may readily be confounded with a commencing pregnancy, the more particularly, because at those epochs the neck usually becomes softer and dilates a little; and I know no way of escaping this error, if the woman insists that she is pregnant, and experiences the various rational signs of that condition. In two cases of the kind I have met with, I only succeeded in detecting the falsity of my diagnosis by examining the woman a second time, two or three weeks after; for these females, who were used as subjects for practising the touch at the Clinique, wished to be considered pregnant; but, unhappily for them, the fortune which aided in the first examination, deserted them at the second; for, being ignorant of the cause of my mistake, they returned at a time still more distant from their menstrual period.

On the whole, then, there is no certain sign of pregnancy during the first three or four months; yet it becomes almost certain, when the sensible signs above indicated coincide with the presence of the rational ones, in a healthy woman who can have no intention of deceiving us as to her condition; still, in a medico-legal case, the physician should express his doubts, and demand a new examination at a more advanced period. But if it is not always possible at the beginning of a gestation to prove that it does exist, we can, at least in the great majority of cases, satisfy ourselves positively that it does not; for most frequently the unimpregnated state of the organ can be readily made out.

3. *Active Movements of the Fœtus.*—The existence of pregnancy is announced during the last five months by certain signs that are far more reliable than any of those hitherto mentioned; these are the fœtal movements, which have improperly been called the *active* and *passive*, but better

designated by M. Stoltz as the movements *proper* and the *communicated* ones. We have already studied the communicated ones in treating of ballottement and palpation of the abdomen; so that it only remains to describe the active movements.

The woman generally perceives the fœtal movements at about four months and a half, although the muscles of the infant had contracted long ere this, unconsciously to her; for every accoucheur must have detected these motions by placing his hand upon the abdomen, at a time when the mother herself still doubted her own pregnancy. Now these movements are excessively feeble at first, and produce a kind of tickling, or rather a sensation analogous to that of the crawling of a spider; they gradually become more characteristic, and may then be classified in two species. One of these is produced by the movements of the whole trunk, or some of its parts, the first of which are recognized by a quivering that is perceptible to the female, while the partial motions give rise to quite large projections, which are even visible through the abdominal walls; the other, on the contrary, are blows, certain small, short strokes, which at times are violent enough to elicit cries from the sufferer, and these shocks are evidently produced by the action of the thoracic or inferior extremities of the child. Such movements, so distinct and clear to the mother, would seem to be an infallible sign of gestation, and yet such is by no means the case, since it is not at all uncommon to find women, whose veracity is beyond question, asserting that they have felt them for a long period, and sometimes the motions have even been perceived by the husband or other persons, yet without their being pregnant.

The history of one of the English queens is well known, who, believing she had felt the motions of a child, dispatched couriers with the happy news to all the foreign courts, but proved to be only the commencement of a dropsy! Such errors are frequent, and there are but few accoucheurs who have not met with many of them in practice. Consequently, the physician should not rely in this matter upon the statement of the woman, but should perceive them for himself before hazarding an opinion. It would seem, indeed, that in some cases, the intestinal movements, the rapid passage of gas in the intestines, certain partial and irregular contractions of the abdominal muscles, and the pulsation of a large artery, especially when situated behind any tumor which it raises at every beat, have often deceived not only the patient, but even her medical attendant.

Some females, from the desire of simulating pregnancy, have acquired the power of contracting their abdominal muscles in so singular a manner, that many able accoucheurs have been deceived, and believing that they felt the fœtal movements, have consequently pronounced them pregnant. (Montgomery, p. 84.)

These motions may be detected by the vaginal touch in certain positions of the breech, or even of the trunk, but we must rely chiefly on the abdominal palpation for their detection. In general, it is only necessary to place the hand flat on the abdomen, or to make use of slight pressure, to perceive them; though if they are feeble and infrequent, it is better to dip the hand in some very cold liquid, and then place it suddenly upon the skin. This rapid change in the temperature of the abdomen probab [illegible] upon the infant, for it generally moves convulsively. I believe, with Dr. Tyler Smith, that the sudden impression of cold is more likely to produce a rapid contraction of the abdominal muscles or uterus, than to act directly upon the fœtus, and that its use might readily deceive as to the nature of the motions which it occasions.

I prefer placing a hand upon one of the sides of the abdomen, and striking with the other on a point opposite; for the fœtus then rarely fails to move briskly as though to resist the impulse.

As before stated, the movements begin to be felt about the end of the fourth month. To this law, however, there are numerous exceptions; thus, some women perceive them as early as the latter half of the third month, others not before the fifth, sixth, seventh, or eighth months of gestation. One woman, who had advanced to the latter period, was brought to the Clinique, in consequence of a fall in the street, and she assured us that she had never felt the movement prior to the accident. We have already alluded to the person, seen by us at La Charité, under the care of Professor Fouquier, who was delivered at term of a very healthy child, but the motions of which were neither perceptible to the mother nor ourselves.

Mauriceau, Delamotte, and many others, bring forward similar cases. But the most remarkable of all is the one reported by Campbell. I knew a lady, he says, the mother of nine children, who, excepting in her first pregnancy, never perceived any motions of the fœtus; but she was herself very inanimate and passive, and what was still more singular, the children were equally nonchalant with herself. Whenever ascites complicates the pregnancy, these motions are very indistinct, thus affording an evidence that it is the abdominal walls, and not the uterus, which perceive the impulse.

After the movements have been distinctly felt, they sometimes diminish without any appreciable cause, both in frequency and intensity, and then altogether disappear, which circumstances demand the most serious attention of the accoucheur, as it is in general an unfortunate symptom.

I believe this spontaneous cessation of the active movements may usually be referred to a congested state of the uterus, which reacts on the child's health. But whatever may be the value of this opinion, it is quite certain that bleeding, under such circumstances, has always produced a favorable result; for when not delayed too long, the movements reappear soon after, and hence I cannot recommend the measure too highly.

4. *Of Auscultation as applied to Pregnancy.*—M. Mayor, of Geneva, first detected the pulsations of the fœtal heart by auscultation; but this discovery, originally published by him in 1818, had been entirely forgotten, when M. de Kergaradec announced, in 1823, that if the abdomen of a woman who has passed the first half of her pregnancy be carefully auscultated, two sounds, which are perfectly distinct in character, will be recognized: one of them, consisting of double pulsations, or rather of redoubled ones, according to the expression of M. Stoltz, is evidently produced by the movements of the fœtal heart, and has been compared, with some reason, to the ticking of a watch enveloped in a napkin; the other is a kind of rustling, unattended by shocks, and consequently without beating, being

characterized by simple pulsations, accompanied by the souffle, which have been successively compared to the sibilant murmur, or to the sound of an erectile tumor, or varicose aneurism; this is called the bellows sound (*bruit de souffle*). Another bellows murmur, of more frequent occurrence than the former, is termed the *murmur of the cord*, and will be studied after the preceding.[1]

[At the end of the third month the pulsations of the fœtal heart may, therefore, be heard, though not as a general rule. Careful and long continued auscultation at this period, however, often enables us to detect with the stethoscope sudden and repeated blows, which would seem to be produced by rapid motions of the fœtus. The sensation is sometimes so clear, and leaves so little doubt as to its cause, that the sound occasioned by the displacement of the fœtus in the amniotic fluid may be accepted as a useful sign in the diagnosis of pregnancy, and one which, in a difficult case, ought not to be neglected. It cannot, however, be always detected, inasmuch as it is necessary that the fœtus should move briskly at the moment of observation.]

1. *Sound of the Heart.*—The pulsations of the heart generally become perceptible in the course of the fourth or fifth month, though more frequently during the latter, and often then at an elevated part of the abdomen near the umbilical region; in one case, however, I thought I heard them a little before the fourth month, but, unfortunately, I could not re-examine the female until six weeks afterwards. M. Depaul declares that he has heard them at the end of the third month and in the eleventh week.

These pulsations are far more frequent than those of the mother's heart; ranging, as they do, from one hundred and thirty to one hundred and sixty per minute; and, moreover, they are very often accelerated or diminished, without our being able to detect the cause of the changes.

Like most observers, I have several times remarked that, if the fœtus exhibited any violent movements during the examination, the pulsation increased and became very difficult to count; but they are not influenced by any variations in the mother's pulse, whatever may be their cause.

The dorsal region of the child seems to transmit the double pulsations most easily, and consequently they are more clearly perceived at that part of the abdomen which corresponds to it. This circumstance likewise explains why the pulsations change position so easily prior to the seventh month; in fact, it is only during the last three months, that extensive movements on the part of the child become difficult, and its position nearly fixed.

They may be heard most frequently on the anterior inferior portion of the abdominal wall, just above the iliac fossa, or still more rarely on the median line, and not merely at a very limited spot, but over a radius of two or three inches. In some cases they may even be heard over more than half of the abdomen; but it is always easy to perceive that they are stronger and clearer at one point than elsewhere, and from this point as a centre, they become weaker and weaker as the distance increases. The intensity of pulsation is of course less marked as the child is younger, although, in some instances, they exhibit as much force in the sixth month as at term, but this is very unusual.

---

[1] The character of this work prevents our giving a detailed account of the history of this important subject. I cannot, however, too strongly recommend all who wish to be fully informed upon the matter, to consult the excellent Monograph recently published by M. Depaul. (*Traité de l'Auscultation Obstetricale*, 1847.)

As regards the number of pulsations, the statement made by many observers that it is much more considerable at an earlier period than at term, is not absolutely true, for the fœtal heart always beats with the same quickness, saving some accidental variations, at whatever period it may be examined. Labor produces no modification of the fœtal pulsations up to the moment of rupturing the membranes; but this rule fails after the amniotic liquid has escaped, because they are then generally louder and clearer, and may be heard over a more considerable extent of surface, which can readily be explained by the fact that the ear or instrument is then nearer the fœtus.

When the contractions become more energetic, the pulsations are not so regular, and they are more feeble and slower while the contraction lasts.

In those cases where the labor is of moderate duration, the indistinctness of the sound of the heart may be referred, I believe, to the difficulty of ausculting during the pain; but if the fœtus has been too long subjected to uterine pressure—as where the labor has been unusually prolonged—the number, force, and regularity of the pulsations sensibly decrease

Most observers have asserted that the sounds are not always perceptible, and M. Stoltz even declares that they cannot be heard whenever the dorsal region is directed backwards, unless some part of the thorax be in contact with a portion of the uterine walls which may be explored. For my own part, I have not failed, for several years past, to hear them in examinations made after the sixth month, in all cases where the children were living; and as my researches have now extended to at least seven or eight hundred women, I feel convinced that we can always distinguish them after that period, in any position of the fœtus whatever.

M. Dubois was the first to point out the fact, that the sound of the fœtal heart has sometimes a peculiar resonance, resembling the metallic tinkling, a singularity which I have twice had the opportunity of observing at the Clinique. This remarkable sonoriety is most frequently met with in women in whom the uterus is distended by a great quantity of fluid. There are also some circumstances which render the pulsation a little obscure and somewhat difficult to hear; thus, for instance, a lumbo-posterior position of the fœtus, a large quantity of water, by which the uterine walls are greatly distended, and a sufficient depression of them by the stethoscope to approach the child prevented; the interposition of several folds of intestines between the abdominal walls and the uterus, and the existence of borborygmi, are all so many circumstances calculated to render the perception of the pulsations more difficult, although not absolutely impossible.

The beatings of the fœtal heart are composed of two distinct sounds, the second being stronger and more sonorous than the first; but, in a great majority of cases, both of them may be heard quite distinctly.

M. Nægèle, however, appears to think that only a single sound is heard under certain circumstances, and I have sometimes made the same observation; but it has always seemed to me that the perception of only one sound might either be referred to bad manipulation on my part, or else to some one of those circumstances just described having prevented the application of the stethoscope over a point near enough to the back of the fœtus. Thus, though I have frequently heard but a single sound at first, after changing the instrument, others became clearly perceptible. I am happy to extract the following paragraph from the thesis of M. Carrière, a pupil of M. Stoltz, which fully confirms my opinion. He says: "I have remarked that the single character of the fœtal pulsations here described, is most likely to be observed when the point examined approaches the fundus of the uterus."

Like all useful discoveries, obstetrical auscultation has had its opponents as well as its partisans; and though the former are daily diminishing in number, the latter certainly have injured their cause by exaggerating its importance; we shall, however, carefully endeavor to ascertain its practical utility.

a. It has been stated that a perception of the pulsations of the fœtal heart was a certain sign of pregnancy, as also that the absence of this sound, positively determined by several examinations made after intervals of some hours, subsequent to the sixth month, announces with certainty the death of the fœtus; supposing, of course, we have a satisfactory assurance of the previous existence of gestation.

[It is a very rare circumstance, says M. Depaul, for the pulsations of the fœtal heart to be inaudible during the three last months of gestation, unless the child be dead. They failed to be detected in but eight cases out of nine hundred and six, examined at this period.]

There is, notwithstanding, one circumstance which might lead to a suspicion of pregnancy even when the uterus was really empty; it is this: in certain females the pulsation of the heart is felt and heard as low down as the sub-umbilical region, and we can imagine that if, in such persons, under the emotions naturally produced by an unjust suspicion of gestation, or, from the influence of any febrile movement, the circulation be accelerated, the pulsations, from their number and rapidity, might be mistaken for those of a fœtus; but in such cases, all errors of diagnosis may be easily avoided by observing: 1st. The perfect isochronism between the pulse at the wrist and the abdominal beatings; and 2d. That the intensity of pulsation constantly increases as the precordial region is approached; which two peculiarities are never presented by the sound of the fœtal heart.

b. Can a twin pregnancy always be recognized by auscultation? It is said that, in most cases, the existence of two children in the uterine cavity may be known by the following sounds: 1st. The sound of the heart will be heard at two distant parts of the abdomen; and 2d. The want of isochronism, and of frequency, which may sometimes be detected between these two series of pulsations.

These characters are advanced by some writers as indicating a double pregnancy with certainty, but we shall point out several sources of error on this point: thus, it frequently happens that the pulsations of a single heart resound in very distant parts. Now, can this be referred, as M. Dubois thinks, to deficient thoracic development, to the unusual comparative size of the heart's cavities, to the density of the lungs, or, lastly, to the position of the fœtus itself, the head and extremities of which, being applied against the thorax, and there receiving the impulses from the heart's contractions, serve to transmit them to a greater distance? I should be inclined to adopt this view; for, whatever be the explanation, the fact is certain, and the following appears to me the best method of resolving the difficulty: Whenever the pulsations are heard at two distant points, the line between these should be carefully followed with the instrument; for if they are produced by the presence of two fœtuses, the pulsations will become feeble, or almost disappear, towards the centre of this line; but if, on the contrary, they are due to a single child, they will be just as strong at its middle part as at either extremity.

Again, the absence of isochronism in the pulsation does not positively prove the existence of two children; for one series may be owing to the fœtal heart, and the other belong to the same organ in the mother, the resonance being transmitted to the abdominal cavity. Hence, it is evident that the unusual distinctness of the mother's pulsations coinciding with the presence of a single fœtus may lead to the belief of a double pregnancy which does not exist, and a comparative examination of the pulse then becomes necessary.

[After all, it must be acknowledged that the pulsations of the fœtal heart may vary from one instant to another, without our being able to comprehend why such should be the case. It may lead, also, to a wrong inference when the auscultation is practised at two different points successively, inasmuch as a want of isochronism might in this case give rise to the impression that there were two children, whilst, in fact, there was heard the sound of but a single heart beating with variable rapidity. To avoid all chance of error, two practised observers should place their stethoscopes over the two points where the sounds are most clearly heard, and then count them together during the same time. Should there be a notable difference between the two numbers thus obtained, a twin pregnancy may be regarded as certain.]

A double gestation may be easily recognized, if the precautions just indicated are observed, because, the twins being habitually placed one on the right the other at the left part of the abdomen, distinct beatings will be clearly heard, if the stethoscope be successively applied to each side. But this happy state of affairs does not always exist, for sometimes one fœtus is situated directly before the other; and then it is nearly impossible, even with the greatest attention, to hear the heart of the posterior child; and, consequently, when the other signs of a twin pregnancy are present, the results derived from auscultation would not prove its non-existence. Is it necessary to add, that equal care should be taken to abstain from hasty decisions in those cases in which there is reason to believe that one of the children is dead?

c. Can we appreciate the state of the child's health or disease, of its debility or vigor, during labor, by means of auscultation?

This question, which was brought before the Academy by a memoir of M. Bodson, and which gave rise to a remarkable report by M. P. Dubois, is certainly one of the most curious and interesting subjects of study; for if we could possibly judge from the signs furnished by auscultation, of the integrity of the fœtal life, no uncertainty could arise with regard to the course to be pursued when the labor is too long delayed, after the rupture of the membranes; for the feebleness and relaxation, or the excessive frequency of the fœtal pulsations; the intermission and irregularity of their rhythm; the absence of the second stroke; or the complete cessation of this phenomenon during the uterine contraction, and the slowness of its return after the pain has ceased, would sufficiently authorize a prompt termination; whilst the opposite phenomena would justify delay.

These signs, and more especially the irregularity of the pulsations, which appears the most important of all, indicate in the clearest manner that the fœtus is in a state of suffering; and hence they should serve as a formal indication to the accoucheur to remove the infant promptly from the danger which threatens it, by an artificial termination of the labor. But, as M. Dubois has very judiciously remarked, there is not then a sufficient integrity of circulation to establish the extra uterine life; for, although the fœtal pulsations may be still regular and sonorous at the moment of birth, yet the child has suffered so much from the long pressure of labor, that the respiration cannot be established; and hence, in this respect, the accoucheur should not rely upon auscultation alone for judging of the opportune moment for the intervention of art, because other considerations quite as important should influence his decision; still, however, this is a method of diagnosis that is never to be neglected.

2. *Souffle of the Cord.*—M. Nægèle, junior, has recently described a bellows murmur, which he attributes to the pulsations of the umbilical cord, and compares it with the sound produced by the beating of the carotids in chlorosis, and the murmur consists, he states, of a simple pulsation which is caused, as he thinks, by the winding of the cord around the neck of the fœtus, or by its compression between the child's back and the uterine walls; the sound increases after the escape of the liquor amnii, and its force is greater in proportion as the arteries of the cord are the more developed, and subjected to greater tension.

In the positions of the head, it is situated below the umbilicus, but higher up in those of the breech, and it seems to descend during the expulsion of the fœtus. Sometimes a bellows murmur is heard accompanying the cardiac pulsations, especially at the first sound, but it appears difficult to reconcile this circumstance with the interruption in the circulation caused by any pressure on the cord. Since M. Nægèle, junior, pointed out this peculiarity, several others have noticed it, and I also have met with it at different times, where nothing would indicate even a slight compression of the cord, or any winding around the neck.

Does this belong to the fœtal heart, as M. Dubois and M. Depaul believe? Indeed, the latter states that he has detected this sound, which he had previously heard during the intra-uterine life, by ausculting the infant immediately after birth. But nine other cases, he says, turned out differently, and oblige me to state the facts as they occurred. The fœtal murmur occupied a part of the uterus entirely removed from that where the beating of the heart was detected; the latter being pure, and unmixed with any murmur. Five of these children were born with one or several turns of the cord about the neck, whilst in the sixth, it surrounded the lower part of the thorax. The remaining three were free from anything of the kind. All were born living, and on none of them was it possible to detect a souffle in the cardiac region immediately after birth.

The question must therefore be decided by new observations; for, although the sound may be produced by the compression of the cord, the compression often exists without the abnormal murmur.

3. *Uterine Souffle.*—Numerous denominations, each of which is founded on its supposed nature, have been applied to this sound; for instance, M. Kergaradec thought it was produced in the utero-placental circulation, and hence gave it the name of the *placental murmur;* on the other hand, M. Bouillaud, and many others, have subsequently assigned its seat (which, to say the least, is very probable) to the large arterial trunks placed on the posterior abdominal plane, where they are subjected to considerable pressure from the developed uterus, and they have denominated it on this account the *abdominal souffle;* and still more recently, M. Paul Dubois has endeavored to prove that it originates in the vessels which ramify in the substance of the uterine wall itself, whence he has called it the *uterine souffle.* But as we shall take occasion hereafter to discuss these three opinions, which embrace all our present knowledge on the subject, we will pass them over here.

In general, the bellows murmur may be heard as soon as the uterus, by rising above the superior strait, becomes accessible to the stethoscope—that is, a little earlier than the sound of the fœtal heart; in fact, M. Delens asserts he has detected it at the third month, and Dr. Kennedy towards the tenth, eleventh, or the twelfth week. M. Depaul has also made the same observation; but as there is a very great difficulty in approaching the uterus at so early a period, these facts are certainly exceptional.

The murmur undergoes some very singular modifications during the course of pregnancy: thus, we do not hear it in every instance; again, it is not at all unusual for it to escape detection for a long time after having once been heard, and then to reappear somewhat later; sometimes even we may auscult for several minutes in vain, when it suddenly appears directly under the ear, augments, becomes quite loud and distinct, lasts for a few moments, then diminishes, and finally ceases altogether.

In other cases, two or three pulsations, attended by *blowing,* are heard during profound silence, but nothing more after that; and on the other hand, very frequent opportunities are afforded us of observing the promptitude with which the sound changes its locality; for it seems to pass suddenly from one point to an opposite one, being sometimes immediately beneath the ear, at others very distant: only covering a single spot in the majority of cases, but occasionally extending to two remote regions, and, what is very remarkable, with equal force and clearness at both these points; further, the extent over which the sound is heard is usually quite limited, but in some instances it becomes perceptible over a very large surface, trespassing upon nearly the whole anterior abdominal region.

On several occasions my pupils have had opportunities of studying all these varieties, which indeed are almost inexplicable, whatever opinion may be adopted as to the cause of the sound.

The murmur is modified during labor; for at the very instant when the pains begin, and even before the patient herself is aware of them, it becomes at once louder, more sonorous, and more distinct, and at times exhibits some strange modifications: thus, at one time the sound heard resembles, partially at least, the tone of a reed, or a tense cord thrown into vibration, though as soon as the contraction becomes stronger and more general, it seems to grow weaker, appearing at longer intervals, and finally becoming imperceptible; but when the pain ceases, the sound returns, at first with the intensity it manifested at the beginning of the contraction, and gradually regains the same sonorousness it had during the gestation. Such is the order presented when the contractions are regular and energetic; but if they are false or irregular, the souffle is not modified, or at least is not any stronger, except it be for a few instants only.

It may likewise be perceived after the expulsion of the fœtus, and even of the after-birth: for example, M. Carrière says he heard it twenty-four hours subsequent to the delivery of the placenta.

Generally, it extends towards the inferior lateral part of the abdomen; more rarely, it is heard near the fundus uteri.

The following is the result of 295 observations, made by M. Depaul, of women who had passed the fifth month of gestation; it will be seen that it accords with my own experience. It was heard very distinctly 182 times on each side of the uterus, at a short distance from the crural arch; in 27 cases, it appeared on one side only; in 43, towards the fundus of the organ; and in 18, it was spread over the entire surface of the uterus. Finally, M. Depaul states, that in 12 cases, it was present in three distinct situations, namely, the fundus of the womb and the parts above the crural arches. During the first half of the pregnancy, it was oftenest observed when the stethoscope was placed upon the median line a little above the pubis.

The character of the sound heard varies greatly; sometimes it is short, abrupt, and separated from the succeeding one by a longer or shorter interval of complete silence, which is dependent upon the frequency of the pulse; sometimes it is a prolonged roaring, a true "bruit de diable," which has its period of beginning, of increase, and termination, the latter blending with the next succession.

In short, it presents all the variations of rhythm which have been attributed to the chlorotic murmurs. Though generally simple and intermittent, it is sometimes continuous and double (bruit de diable); finally, it may be both continuous and simple. I have not yet met with the typical, double intermittent sound. Like the murmur in the carotids, the rhythm may change in a few moments so as to present in a very short time several of the varieties just mentioned.

The quality of the sound also varies greatly; and this not only in different women, but even in the same woman, and sometimes whilst the exploration is going on. Occasionally it is whistling, and resembles much the sound of the wind blowing through a badly closed doorway; again it becomes roaring, so as to imitate the vibrations of a base cord; at other times it is plaintive, suggesting the cooings of a turtle-dove.

The seat and mode of production of this sound is a question that has given rise to much controversy, though, as the sound is synchronous with the mother's pulse, it must be evidently connected with the maternal vascular system. Thus far all agree, but diversities of opinion immediately spring up when a more precise location of it is attempted; for the murmur is produced outside of the uterus, exclaims one party; not so, it is seated in the uterine or the placental vessels, say the others.

1. *The Murmur is produced in Parts distinct from the Uterus.*—Whenever a tumor is developed over the course of a large arterial trunk, the compression exercised by it on the vessel produces a souffle, and it is not at all unusual, whenever a pathological tumor is developed in the abdomen, to hear a murmur in such cases, very nearly resembling that of pregnancy; now, the uterus developed by a product of conception constitutes a considerable tumor, one which must necessarily compress the vessels and produce the effect described. This view is advocated by numerous partisans, who contend that the murmur does not begin to appear until the uterus really compresses the iliac vessels by being elevated above the superior strait; that it is usually heard at the inferior lateral part of the abdomen, and more frequently on the right side, because the uterus is habitually inclined to the right; and lastly, that if, according to the plan of my friend, Dr. Jacquemier (which I have since often practised myself), the female, after having been auscultated in the supine position, be made to kneel down, with the body bent forward nearly horizontally, and the elbows resting on the ground, in a word, in such a position as to throw the whole weight of the uterus upon the anterior abdominal wall, the murmur will no longer be heard, although distinctly audible before.

In support of this opinion the following considerations may be adduced:

The abdominal souffle is, like that of chlorosis, partly due to the alterations which the blood undergoes during pregnancy. Whatever theory be embraced respecting the mechanism of these abnormal vascular sounds in chlorosis, whether they be attributed to the diminution of the corpuscles, as M. Andral supposes, or to hydræmia, according to M. Beau, and, we may add in passing, this latter theory seems to me to be the only admissible one, the great analogy between the blood of chlorosis and that of pregnancy cannot be ignored.

It is equally difficult not to recognize the entire resemblance between the souffle of pregnant women and that of chlorotic patients. They exhibit the same varieties of rhythm, as also of tone and sonorousness; both are sometimes mixed or composed simply of buzzing, rasping, or whistling sounds, which seem to be alike peculiar to the early stages of the affection. Both present, if I may so express it, the same mobility of duration, rhythm, and intensity, and appear to be similarly affected by the greater or less pressure of the instrument, as also by changes in the circulation of the female as a consequence of disturbances of temper, violent movements, &c.

Is it not, therefore, natural to conclude, that since pregnancy and chlorosis produce the same changes in the blood, the souffle, which is exactly alike in both cases, is also due to the same cause?

But, it will be replied, in chlorosis the murmur is heard more especially in the cervical region; why, therefore, during pregnancy should it, if due to the same cause, fix itself particularly in the abdomen? I would reply, in the first place, that in some cases the cardiac and carotid murmurs have been observed in pregnant women; still I admit that, most generally, they are not heard even when the abdominal souffle is present. The latter circumstance can be readily explained, for it is in fact rarely that the alteration of the blood is carried to the same extent as in ordinary chlorosis; the proportion of globules rarely descends below one hundred, and the amount of water is far from equalling the enormous proportion which it reaches in chlorosis. Now, if it be true, as M. Andral supposes, that the production of abnormal sounds is an indication of a more advanced alteration, we can comprehend why they should not be perceptible in the carotids, where only poverty of the blood could produce them.

The conditions are not the same in the abdominal vessels, for there, to a commencing hydræmia, is superadded a considerable diminution of the calibre of the vessels, which diminution is a result of the compression of the uterine tumor; and these two circumstances united are capable of producing a souffle which they would be unable to determine singly. The compression of the arteries thus gives rise to a sort of insufficiency, which renders still more sensible the slight increase which the total amount of the blood has undergone.

It has been stated that we have several times known the sound to disappear when the woman was placed on all fours, but that in other instances it still remained. M. Depaul recollects having repeated this experiment, with the effect of continuing to hear the uterine murmur, without the slightest variation. This last remark, made by such observers as MM. Depaul and Carrière, deserves further attention on our part. As M. Beau has pointed out, it is much more difficult than would be supposed, and sometimes even impossible, to cause the woman to assume such a position that the large arteries shall escape all compression by the uterus. The abdominal walls of young primiparous women are too resisting to yield under the momentary weight of the uterus, and whatever position be assumed, they retain the organ strongly applied against the posterior plane of the abdomen.

M. Beau has also proved that this persistence of the abdominal souffle is not peculiar to pregnancy, but that in the case of a woman affected with a cyst of the ovary, shown to be such at the autopsy, it was impossible to give the tumor any position in which it ceased to compress the arteries of the pelvis, and consequently to put an end to the murmur.

I would add, that, whilst admitting that compression is not the sole cause of the murmur, but that the serous plethora of pregnancy also contributes to its production, it might be readily supposed that if the latter reach a certain degree, it might of itself give rise to the abnormal sound, even should the position of the female entirely relieve the abdominal vessels from pressure.

The same remarks will apply to the variable results which are sometimes obtained, when, after having heard the sounds on one side of the abdomen, the woman is made to reverse her position. Sometimes, we have said, it ceases to be heard; at others it persists, although the inclination of the uterus had removed the pressure from the vessels on the point opposite the side upon which the woman lies. In the first case, the plethora was too slight to maintain a sound, the production of which was partly due to the compression of the vascular tube; in the second, either the inclination of the uterus had not removed the pressure, or else the alteration of the blood was alone sufficient to produce the abnormal sound.

Although MM. Barth and Roger are disposed to attribute the abdominal murmur to pressure, they nevertheless find some objections which prevent their adopting the opinion in its full extent. Why, say they, is not the sound increased when the uterus is pressed upon with the stethoscope, and why does it sometimes disappear when the pressure is made rather stronger? It is, replies M. Beau, because the murmurs are the result of a certain degree of pressure, which if increased or diminished, the sounds are altered or lessened. The effect is the same as that which is frequently observed in the carotid murmurs, which do not increase, and which even disappear, when too much pressure is made upon the artery; and as these latter sounds are sometimes found to have their intensity somewhat increased by a slight pressure, so the abdominal murmurs are occasionally notably increased when the uterus is a little pressed upon.

Finally, how happens it, say MM. Barth and Roger, that in certain cases in which no souffle was heard upon auscultation of the abdomen, it could, through the assistance of the metroscope of M. Nauche, be perceived upon the neck of the uterus, which is situated in the centre of the pelvic cavity, and therefore removed from the vessels?

We may suppose, again replies M. Beau, that in the cases in question the murmur had its origin in the hypogastric arteries. Now the neck of the uterus is nearer these arteries, than that part of the body of the organ which is in relation with the abdominal parietes. Besides, it is not possible that certain organs which are poor conductors of sound, such as a mass of intestine or of omentum, might have been interposed between the surface of the uterus and the walls of the abdomen, and thus have prevented the transmission of the vibrations to the ear?

2. *The Murmur is produced in the Uterus.*—Those who locate the sound in the uterine circulation, differ essentially as to its precise seat and the mode of its production. Thus, M. de Kergaradec attributes it to the placental circulation; whilst M. Hohl, who also believes it is perceived at the point where the placenta is inserted, locates the murmur at a point corresponding to the insertion of the placenta, and bases his opinion upon the following reasons: 1. In 21 cases in which he removed the placenta with his hand, he found it adhering where the souffle was first heard; 2. In 15 cases where it was inserted upon the orifice, the murmur was heard very low down; 3. In 10 others the autopsy revealed the after-birth where the souffle had been distinguished; 4. In 8 cases of version the same fact was discovered directly; 5. In 12 cases of twin pregnancy, one murmur only was heard when but a single placenta was present, and two distinct ones when the after-births were separate; 6. Lastly, in a great number of cases the intensity of the sound appeared to be in direct relation with the bulk and extent of the placenta.

M. Hohl differs from M. Kergaradec by supposing that the sound results from the passage of the arterial blood into the venous sinuses of the placenta; but, to refute this latter opinion, it is only necessary to bear in mind the great variety in the seat of the murmur during pregnancy, and that in some cases it is still perceptible after the delivery of the after-birth.

I am therefore, like M. Depaul, convinced, that there is no relation between the point where the souffle is heard and that of the insertion of the placenta.

The views of M. Dubois still claim a notice; for whenever, says this Professor, the disposition of the uterine apparatus is carefully studied, the freest communication will be found to exist between the arteries and veins, the uterine walls appearing to be transformed into an erectile tissue, or one of varicose aneurisms; and the column of blood brought by the arteries, and divided through their branches, mingles, whilst passing directly into the veins, with the slower and less compressed columns contained in the canals of the latter. This circumstance is incontestably the cause of the murmur and souffle that is so remarkable in varicose aneurisms and the accidental erectile tissues, and it is very likely that the same cause produces it in the uterine walls. Hence we can comprehend why it is only heard at that period when the vascular modifications of the organ are the most marked; why it is most frequently audible over the spot corresponding to the placental insertion, because the development of the uterine vascular system is the most considerable there; and finally, why this sound may still be heard in some women after delivery, when the retreat of the uterus is not yet complete, and the circulation in its walls has not been reduced to its condition in the non-gravid state.

No one, since the researches of M. Dubois, has been able to rediscover the large and free communications between the uterine arteries and veins; it is in fact certain, that they communicate directly in no other way than through their terminal and capillary ramifications. It is plain, that when a supposed anatomical fact is proved to have no existence, the theory which is founded upon it can no longer be maintained.

There are still some other points concerning the uterine circulation, which have recently been advanced: thus, Dr. Corrigan thought the passage of the blood from the uterine arteries into the sinuses, was the cause of the souffle; and M. Carrière, who admitted this opinion, added, that the circulation being much more active at the point corresponding to the placental insertion, the sound should be most audible on a level with that insertion.

M. Depaul has quite recently repromulgated the views of Corrigan, adding thereto the compressions produced both within and without by some portion of the fœtal ovoid, and he attributes an important influence to these compressions, which, however, had previously been brought forward by M. de Kergaradec, in explanation of the frequent variations of the souffle in its seat and intensity.

The cause of the sound, says M. de la Harpe de Lausanne, neither rests on a particular condition of the blood, nor on a modification of its course, nor yet in any peculiar state of the vessels, but simply on the multiplicity of the vessels concentrating at the same point; which multiplicity, by increasing the currents a hundredfold, increases the sounds in the same ratio; thus rendering those audible by multiplication, which, taken singly, were imperceptible to the human ear. Perhaps a comparison will serve to illustrate this idea: if a person place himself, on a mild day, under a tree that has been closely pruned, deprived of its leaves, and only having some large branches left, he will hear no sound or rustling of the air; now let him pass from this tree to another one better furnished with branches, though still deprived of leaves, and he will perceive, if the same air be stirring, a commencing sound, produced by the branches that are agitated in the wind; again, the intensity of sound will become much greater, if he once more changes to a fir-tree; for notwithstanding the leaves of this latter are rigid and immovable, yet they are innumerable; and just such is the case with the placental murmur. In fact, a liquid cannot circulate in a tube without producing a certain amount of sound by the friction of its molecules against the walls of the tube; only the sound is not detected by the ear when the vascular canal is isolated, but the contrary results, when thousands of little canals are found at the same point.

[Amidst so many contradictory theories we shall not undertake to decide upon the mechanical production of the bellows murmur, but will endeavor to determine the seat of the sound, premising, however, that we do not believe that it is produced in the great blood-vessels which are situated behind the uterus. The sound is sometimes really so superficial that it cannot be produced in the aorta or the iliac vessels; how, besides, will this explanation enable us to understand the facility with which it changes place, a circumstance to which all observers can testify? Finally, we would add that, in some very rare cases, the sound is accompanied by a thrill, which is easily perceived by the finger, and felt, so to speak, to be produced behind the anterior wall of the abdomen. We regard it, therefore, as certain that it is produced in the uterus, and as we have already shown that it cannot have its origin in the placenta, we agree with MM. Dubois and Depaul, that it is located in the walls of the uterus. It is evident, therefore, that the term uterine souffle is the only one which can be properly applied to it.]

The abdominal souffle is not of great practical importance; its value, as a sign, is limited to rendering the existence of pregnancy probable. It may exist independently of pregnancy, and does not always accompany it; it is not influenced by the life or death of the fœtus, nor is it modified in any degree by a state of suffering of the child; it cannot, in any case, enable us to determine certainly either the place of insertion of the placenta, nor its form, size, or the changes which it may undergo. The observations of MM. Depaul and Nægèle, Jr., prove, in opposition to the conclusions of Hohl, that the diagnosis of double or triple pregnancies, is incapable of assistance from the souffle, presenting as it does in these cases no modifications which are not also observed in simple pregnancies.

Summary.—It is now well understood that, in ausculting the abdomen of a pregnant woman, we may hear both the pulsations of the fœtal heart and the bruit de souffle. The first is a certain sign of pregnancy; but the second, being also produced by other causes, only becomes of importance when we have previously ascertained that the female has no other disease.

The sound of the heart may aid in ascertaining the position of the fœtus; the souffle can communicate no information as to the place of insertion of the placenta, and indicates nothing as regards the child's position; while any feebleness, and more especially any irregularity or intermittence of the heart's pulsations, furnish strong presumptive reasons for believing that the fœtus is suffering, and that its life is compromised.

When desirable to auscult a female who is supposed to be pregnant, we must request her to lie down on her back; at the commencement of gestation this precaution is indispensable; but towards the last it becomes less so, and she may then be examined standing. In fact, whatever be her position in the latter months, this exploration is quite easy, on account of the dimensions of the uterus and the volume of the fœtus, but at first it is nearly always necessary to flex the thighs upon the belly, so as to completely relax the abdominal muscles, and of course this could only be done in the horizontal position. The dorsal or lateral decubitus is requisite to explore thoroughly the fundus or sides of the womb, and also to cause the fœtus to fall from either side; the thighs should also be flexed, or extended, according to the region examined. The unaided ear will answer, but the stethoscope should generally be employed; for, by using it, the sounds detected can be more readily limited, and the abdominal parietes more easily depressed so as to approach nearer to the fœtus; besides, many females object to the accoucheur thus applying his head flat on the abdomen. Experience has likewise convinced me that, when the unassisted ear is used, the clearness of the sensations is singularly diminished by the frictions which the respiratory movements of the abdomen make against the ear. When used, the enlarged extremity of the instrument should be deprived of its mouth-piece, and its whole circumference be exactly placed over the region to be ausculted.

It is also advisable that the woman lie on a bed of sufficient height, otherwise the accoucheur is obliged to stoop too much, and this inconvenient position is attended by such a degree of congestion as to render it impossible to hear anything. And further, to avoid all unnecessary searching, it is best to place the stethoscope at first directly over the part where the pulsations of the heart are most commonly heard, that is, in front, below, and a little to the left side.

It is equally desirable to ascertain from the female where she generally perceives the fœtal movements, for most frequently the pulsations of the heart will be found on the opposite side, because the superior and inferior extremities being always folded on the abdominal plane, the back, in other words, the part of the fœtus which most easily transmits the sounds, will evidently be turned towards the left, if the right side is the habitual seat of the active motions.

Before the fifth month, the pulsations are usually perceived in the lower part of the abdomen on the median line, about half-way between the pubis and umbilicus; consequently the instrument should be first applied there.

The instrument proposed by Nauche, under the name of metroscope, the extremity of which is intended to be introduced into the vagina and applied to the neck or inferior part of the womb, ought not to be used.

A Table exhibiting the Signs of Pregnancy at various Periods.

RATIONAL SIGNS.	SENSIBLE SIGNS.
First and Second Months.	
1. Suppression of the menses (numerous exceptions).	1. Augmentation in the size and weight of the uterus.
2. Nausea — vomiting.	2. Descent of the organ.
3. Slight flatness of the hypogastric region.	3. The womb is less movable.
4. Depression of the umbilical ring.	4. Its walls have the consistence of caoutchouc.
5. Tumefaction of the breasts, accompanied with sensations of pricking and tenderness.	5. The neck is directed downwards, forwards, and to the left.
	6. The orifice of the os tincæ is rounded in primiparæ, but more patulous in others who have had children.
	7. A slight softening of the mucous membrane covering the lips, and this membrane appears œdematous.
Third and Fourth Months.	
1. Suppression of the menses (a few exceptions).	1. The fundus uteri rises to the level of the superior strait towards the end of the third month, and is perceived at the close of the fourth about the middle of the space between the umbilicus and pubis.
2. Frequently, the appearance or the continuance of the vomitings.	2. A perceptible flatness on percussion in the hypogastric region.
3. A small protuberance in the hypogastric region.	3. A rounded tumor, as large as a child's head of a year old, may be detected by the abdominal palpation.
4. Less depression of the umbilical cicatrix.	4. By resorting to this process and the vaginal touch jointly, the displacement en masse, and the volume of the uterus may easily be ascertained.
5. Augmented swelling of the breasts, prominence of the nipple, and slight discoloration in the areola.	5. The neck has the same situation and direction during the third month as in the preceding ones; at the fourth it is elevated and directed backwards and to the left side.
6. Kyesteine in the urine.	6. The softening of the periphery of the orifice is much better marked. The latter is more open in *multiparæ*, even admitting the extremity of the finger; but is closed and always rounded in primiparæ.
Fifth and Sixth Months.	
1. Suppression of the menses (some rare exceptions).	1. The fundus uteri is one finger's breadth below the umbilicus at the end of the fifth month; and the same distance above it at the expiration of the sixth.
2. The disturbances in the digestive organs generally disappear.	2. Fœtal irregularities, and active movements, which are very perceptible.
3. Considerable development of the whole sub-umbilical region.	3. The sound of the heart and abdominal souffle are now perceptible.

RATIONAL SIGNS.	SENSIBLE SIGNS.
4. A convex, fluctuating, rounded abdominal tumor, salient, particularly on the middle line, and sometimes exhibiting the fœtal inequalities.	4. Ballottement.
5. The umbilical depression is almost completely effaced.	5. A tumor is felt at the anterior superior part of the vagina, which is sometimes soft and fluctuating, at others rounded, hard, and resisting.
6. The discoloration in the areola is deeper; glandiform tubercles; areola spotted.	6. The inferior half of the intra-vaginal portion of the cervix uteri is softened.
7. Kyesteine in the urine.	7. The whole ungual part of the first phalangeal bone can penetrate the cavity of the neck in *multiparæ*. The latter is softened to the same extent in primiparæ, but the orifice is closed.

Seventh and Eighth Months.

RATIONAL SIGNS.	SENSIBLE SIGNS.
1. Suppression of the menses (the exceptions are very rare).	1. Increased size of the abdomen.
2. Disorders of the stomach (rather rare).	2. The fundus uteri is four fingers' breadth above the umbilicus at the seventh month, and five or six at the eighth.
3. The abdominal tumor has the same characters, except that it is more voluminous.	3. The organ is nearly always inclined to the right.
4. A complete effacement of the umbilical depression, the dilatation of the ring, and sometimes a pouting of the navel.	4. More violent active movements of the fœtus.
5. Numerous discolorations on the skin of the abdomen.	5. Sounds of the heart and abdominal souffle.
6. Sometimes a varicose and œdematous condition of the vulva and inferior extremities.	6. Ballottement is very evident during the seventh month, but more obscure in the eighth.
7. Deeper discoloration of the central areola, and an extension of the spotted areola. Sometimes there are numerous stains on the breasts; flow of milk; complete development of the glandiform tubercles.	7. The softening extends along the neck, above the vaginal insertion. In primiparæ, the cervix is ovoid, and seems to have diminished in length; in others it is conoidal, the base being below, and sufficiently patulous to admit all the first phalanx. The neck at its superior fourth is still hard and shut up.
8. Persistence of kyesteine in the urine.	

First Fortnight of the Ninth Month.

RATIONAL SIGNS.	SENSIBLE SIGNS.
1. The vomitings frequently reappear.	1. The fundus uteri reaches the epigastric region and gains the border of the false ribs on the right side.
2. The abdominal tumor has increased; the skin is much stretched, and very tense.	2. Active movements. Sounds of the heart and abdominal souffle.
3. Difficulty of respiration.	3. Often there is no proper ballottement, but merely a kind of rising of the tumor formed by the head.
4. All the other symptoms persist, and are increased in intensity.	4. The neck is softened throughout its whole length, excepting the circumference of the internal orifice, which still

RATIONAL SIGNS.	SENSIBLE SIGNS.
	remains closed and resisting. In women who have previously borne children, the finger may be introduced into the cervix to the extent of a phalanx and a half, and in fact is only arrested by the internal orifice, which is closed and wrinkled, though, in some cases, already beginning to open. In primiparæ, the softening is equally extensive, and the neck is swollen in the middle in an ovoidal form; but the external orifice, although partially opened, does not permit the introduction of a finger.
Last Fortnight of the Ninth Month.	
1. The vomitings often cease.	1. The fundus uteri has sunk lower than in the first fortnight.
2. The abdomen is fallen.	2. Active movements; sounds of the heart and bellows murmur.
3. The respiration less oppressed.	3. Ballottement often imperceptible.
4. More difficulty in walking.	4. The head more or less engaged in the excavation.
5. Frequent and ineffectual desires to urinate.	5. In *multiparæ*, the internal orifice softens and dilates; the finger can then penetrate through a cylinder, as it were, an inch and a half in length, and come into contact with the naked membranes. In *primiparæ*, the internal orifice experiences the same modification, but the external remains closed. During the last week, in consequence of the spreading out at the internal orifice, the whole cavity of the neck becomes confounded with that of the body, and the finger, in reaching the membranes, only traverses a thin orifice in primiparæ, but a rounded collar in the others of a variable thickness.
6. Hemorrhoids; augmentation of the œdema and varicose state of the lower extremities.	
7. Pains in the loins, and colics.	

CHAPTER VII.

OF TWIN PREGNANCY.

THE term compound or multiple pregnancy has been applied to that in which two or more fœtuses are inclosed in the uterine cavity. Certain females seem to be greatly disposed to these anomalies; thus, cases are recorded where six, seven, and even eleven children have been born at three successive confinements.

Double pregnancies are quite frequent: that is, one case is met with in about seventy or eighty labors. Triplets, on the contrary, are very rare, since there were but five in the records of 37,441 accouchements that occurred at La Maternité in Paris. Further, we cannot call in question those instances in which there were said to be four at a birth; for such men as Viardel, Mauriceau, Hamilton, and many others, furnish examples of it.[1] Both Peu and Lauverjat declare that they have witnessed cases of five at a birth.[2] And lastly, must we consider those cases of six, seven, eight, and

---

[1] The following statistical account is extracted from Churchill's work. In 161,042 pregnancies, there were 2477 cases of twins, or 1 in 69, and 36 triplets do., or 1 in 4473 (English accoucheurs).

In 36,570 pregnancies, there were 582 cases of twins, or 1 in 110, and 6 triplets, or 1 in 6095 (French accoucheurs).

In 251,386 pregnancies, there were 2967 cases of twins, or 1 in 84, and 35 triplets, or 1 in 7185 (German accoucheurs).

Total, in 448,998 cases, there were 5776 instances of twins, being 1 in 77¾, and 77 triplets, or 1 in 5831.

The same author furnishes the accompanying information as to the sex of the twins: Dr. Joseph Clarke states, that in 184 twin cases, both children were boys 47 times, girls 68 times, and one boy and one girl 71 times.

Dr. Collins reports 240 cases, in which there were two males 73 times, two females 67 times, and male and female 97 times; and Dr. Lever 33 cases, two males 11, two females 11, and male and female 11.

[2] M. Pigné informed me that he saw a single placenta at Strasbourg, from which five separate cords arose, although only a single sac existed, which was composed of three membranes, decidua, chorion, and amnion, in which the five embryos were inclosed.

Dr. Kennedy (*London Med. Gazette*) presented to the Royal Society the history of a woman who aborted at three months of five embryos. There were three ovums, one being double, and each ovum had a placenta and its own proper membrane.

M. Bourdois (*Gaz. Méd.*, p. 569, 1850) describes a quadruple pregnancy, in which the delivery occurred at the seventh month. The second child was born twelve hours after the first, and the other two a few minutes subsequently. The second accouchement was attended by a new discharge of waters; there were two placentas, one of which had three cords and was adherent, and some portions of it remained behind in the uterus.

Dr. Hull, of Manchester, deposited five little twin fœtuses in the Museum of the London College of Surgeons, that he had obtained from a woman who aborted at the fifth month of gestation.

Chambon records an instance of quintuple pregnancy, where the children survived their baptism.

A woman of Naples was delivered of five infants at seven months. (*British and Foreign Med. Review*, 1839.)

Dr. Kennedy (Every) states (in the *Dublin Med. Journal*, Jan. 1840), that a woman

M. Guillemot believes that one child, in its growth, gradually compresses the second against the uterine wall, and the latter, not having sufficient space for its development, soon after dies. Lastly, M. Cruveilhier explains the atrophy of the fœtus by a gradual separation of the placenta, founding his opinion on a single case, in which the hemorrhage was great enough to account for the early death of one of the twins; but in the greater number of cases that have been recorded, no mention whatever is made of any hemorrhage during the pregnancy; whence, of course, the opinion of M. Cruveilhier would not be applicable to them. For my own part, I believe these cases, in which the death and atrophy of one fœtus takes place, should rather be attributed to some disease of the infant or placenta, or of some parts of its envelopes. It may be urged, indeed, that these alterations are not observed at the time of accouchement, which is not to be wondered at, considering the state of degeneration exhibited by all parts of the ovum; and, although no positive fact sustains this opinion, it seems to me more admissible and more rational than the others.

It not unfrequently happens that twin pregnancies terminate before full term, owing, doubtless, to the great distention of the uterus, which is often as large at seven or eight months as in a simple pregnancy at nine months. The same labor generally suffices for the expulsion of both, though such is not always the case; for, after the first child is born, the uterus may retract upon the remaining twin, and leave it unexpelled for eighteen or twenty-four hours. A still longer interval, several months even, may separate the two parturitions; and it is upon such facts as these that some persons have improperly admitted the doctrine of superfœtation. A reference to the latter is, however, unnecessary to explain these observations, for the cause of premature delivery is dependent solely on the enormous distention of the uterus, because as soon as one infant is expelled the womb retracts, the cause of irritation no longer exists, and we can readily conceive that the gestation may continue on until term. A child born at seven months may live equally well with one delivered at the end of pregnancy.

The peculiarities just studied in twin pregnancies may also present themselves in cases of triplets, &c. Thus, in a case cited by Portal, after the delivery of the first child and its placenta, which were healthy, he was obliged to extract two others that had apparently been dead for a long time, and were thoroughly dried.

Again, the membranes are not always disposed in the same manner in these pregnancies; and on this head we may admit, with M. Guillemot, who has particularly studied the subject, four distinct varieties: thus, in the first, two ovules are fecundated, and each embryo becomes developed, and is surrounded by its own proper membranes; in the second, the ovule contains two germs, though each fœtus has but a single envelope, the chorion being a common membrane; in the third, both embryos are inclosed in a single cavity, which appears never to have been divided by any membranous diaphragm; and, finally, the last variety is met with when the ovule contains a second germ, and both become developed together, which gives rise to what are called monstrosities by inclusion. Adopting this classification as the basis, let us now proceed to the different modes of termination presented by these pregnancies, according to the species to which they belong.

1. In the first variety, both ovules are developed, retaining their proper membranes, the chorion and amnion; at first, each ovum has its own reflexed decidua, but generally that portion of the latter which forms the partition is very thin, and becomes absorbed as the gestation advances, and a single decidua then appears to envelop both.

The two chorions repose against each other, being only separated by some very fine areolar tissue, so that the children are divided by one very thick partition composed of four layers. The placentas are sometimes separate, though usually confounded with each other, or else are united by a kind of membranous bridge; but, notwithstanding the continuity of tissue, there rarely exists any vascular communication between them, and this fact is so uniform that the exceptions to the law are very rare indeed. From all which it must therefore be evident that two distinct ovules have been fecundated, whether they are deposited separately, or are contained in the same vesicle. The first variety is the most frequent.

2. In the second variety of compound pregnancy, the chorion is common to both twins, and each fœtus has but a single envelope formed of the amnion—the two laminæ of which, resting against each other, constitute the median partition. MM. Dance and Mancel have furnished an example of this variety in which there were but two children. Brendelius reports that a woman was delivered of two girls after three days' travail, but she died before the extraction of the third infant, which was found dead on opening her body; the placenta was single and very large, and the chorion had been common to all three, although each fœtus had a distinct amnion.

There is therefore only a single placenta, and a communication nearly always exists between the ramuscules of the two cords, as I have verified myself, on a placenta, which was presented by one of my former pupils, an Interne of the Ursuline Hospital, where he obtained it. In this, as in the preceding variety, one fœtus may die, the other continuing to live; but it is easily foreseen that an expulsion of the two children cannot take place separately.

3. Further, it may happen that the fœtuses are not separated by any partition, and are all shut up in the same amniotic cavity; and to the examples of this kind, already cited, I may add a case observed by my friend and colleague, Dr. Fournier. The two cords arise, most frequently at least, from a distinct point of the placenta; but sometimes they are observed to come from a common trunk, which bifurcates at a variable distance from the placental surface. In this variety, the expulsion of one fœtus must evidently be followed by that of the other; but I do not know to what extent we can justly say that the death of one necessarily endangers the other's life, if not speedily delivered by nature. (Baudelocque.) This inclusion of two fœtuses in the same amniotic cavity is often met with in those cases where one of them is destitute of an important part of its body: thus, the monstrosity that I presented to the Royal Academy of Medicine was inclosed in the same sac with its twin brother.

nine children, or even more, at once, so many examples of which are found in the authors, as true statements or as fabulous tales?

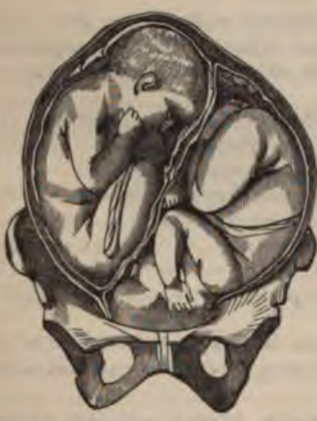
It is a very difficult matter to point out the causes of this anomaly in the present state of our science; true, numerous explanations have been offered, but all are nothing more than pure hypotheses: for example, it is said that a single fecundation may affect both ovaries, or two of the Graafian vesicles in the same ovary; and again, that several impregnations may occur successively in a short period, that is, before the first fecundated ovule has arrived in the uterus. Both take it for granted that two ovules are detached, either at the same time or successively, from the ovary, and, consequently, that two corpora lutea are developed. Several well-attested facts prove, however, that a different state of things may take place; thus, for instance, two ovules have sometimes been found in the same Graafian vesicle, and it is evident that the rupture of this vesicle alone, in such a case, might produce a double fecundation; at other times, two yolks have been seen in the same ovule, and in such a condition a twin pregnancy might certainly occur, although but one ovule be fecundated.

Hereafter we shall see, that these peculiarities serve to explain the varied disposition exhibited by the membranes be compound gestations.

It is frequently possible to recognize the presence of twins during pregnancy; indeed, the abdomen is ordinarily more voluminous then than at other times, and the belly is generally flattened on the median line, instead of presenting there a well-marked protuberance; the middle is depressed, in consequence of the two children lying one upon each side; nevertheless, this sign may fail when one child happens to be placed before the other.

The form of the uterus varies also with the position of the fœtuses, their number, and the amount of amniotic fluid. Thus, when the head of one is above, and that of the other below, there may result therefrom two corresponding depressions and projections, as M. Hergott has represented. Should both present by the head, the fundus of the womb will be very much dilated, and the contrary is the case when they present by the pelvis. In a case which occurred at the Clinic of Strasbourg, the shape of the womb was irregular and oblique; the two heads occupied the angles of the uterus, and formed two tumors separated by a depression; the one at the right being much the higher. The twins were born by the feet.

FIG. 73.



The slight blows perceived by the mother are sometimes felt at one and the same time in two distant parts of the abdomen; and the importance of auscultation as an element in this diagnosis has already been pointed out. (See p. 256.)

---

aborted of five embryos between the second and third months of gestation; and finally, Dr. Francis Ramsbotham has collected three cases of quintuple pregnancy from the public journals.

The bellows murmur can, I think, rarely furnish useful information. Still, it is asserted by Hohl, that in sixteen twin pregnancies, the murmur was heard seven times on both the right and left sides simultaneously, and nine times on one side only; and he affirms, that when the latter was the case, there was a common placenta, whilst in the other instances there were two. He is also of the opinion, that a double souffle is diagnostic of a double pregnancy, even though the sound of the heart be heard at a single point only. We cannot admit the last conclusion, since we have already denied the very relation which Hohl would establish between the seat of the murmur and the insertion of the placenta; besides which we have often heard a souffle on both the right and left sides in single pregnancies.

Again, as the two fœtuses mutually interfere with each other, neither of them presents itself to the vaginal touch; and of course the ballottement is then exceedingly difficult, if not wholly impossible; for, even if the finger should easily reach the presenting part, the presence of another child would interfere with the ascending movement of the first. Desormeaux, however, cites a case where the ballottement was manifest in a twin gestation, but even here a large quantity of water was present at the same time. Whilst in charge of the Clinic of the Faculty, in 1845, I observed on two occasions the same fact noticed by Desormeaux; for the existence of dropsy of the amnion rendered the ballottement very perceptible, although two children were present.

The course of twin pregnancies is sometimes accompanied by peculiarities which it is important to be acquainted with. Thus, the two fœtuses do not always attain to the development which we have indicated. One of them may die, and yet the other continue to grow. In such cases, which, however, are rare, the dead body may remain in the womb, where it hardens, withers, and is expelled during labor.

In my course of 1853, I exhibited a placenta obtained from a woman who was delivered at term of a living and well-developed child. It was provided with two amniotic bags, one of which belonged to the living child, and presented no unusual appearance. The other, which was much smaller, contained barely a trace of fluid, but inclosed a small mummy-like fœtus, about the size of one of four months' development. On the other hand, the dead fœtus may irritate the uterus, bring on contractions, and be expelled, whilst the other remains and is developed as usual.

Lastly, the twin that perished during pregnancy may still remain in the womb, in consequence of the adherences which its placenta has contracted with that organ, for a long period after the expulsion of its living brother, that occurs at the ordinary term of gestation.

Guillemot furnishes one of the most curious observations of this kind (*Heureux Acc.*, livre ii. p. 225) on record, in which the artificial extraction of the dead body did not take place until two years after the accouchement. But what is the cause which thus determines the death of one fœtus?

Mauriceau and Peu thought it might be attributed to the fact that one child, by receiving all the nourishment, becomes strong and vigorous at the expense of the other, thereby rendering it feeble and languishing, and causing its early death.

M. Guillemot believes that one child, in its growth, gradually compresses the second against the uterine wall, and the latter, not having sufficient space for its development, soon after dies. Lastly, M. Cruveilhier explains the atrophy of the fœtus by a gradual separation of the placenta, founding his opinion on a single case, in which the hemorrhage was great enough to account for the early death of one of the twins; but in the greater number of cases that have been recorded, no mention whatever is made of any hemorrhage during the pregnancy; whence, of course, the opinion of M. Cruveilhier would not be applicable to them. For my own part, I believe these cases, in which the death and atrophy of one fœtus takes place, should rather be attributed to some disease of the infant or placenta, or of some parts of its envelopes. It may be urged, indeed, that these alterations are not observed at the time of accouchement, which is not to be wondered at, considering the state of degeneration exhibited by all parts of the ovum; and, although no positive fact sustains this opinion, it seems to me more admissible and more rational than the others.

It not unfrequently happens that twin pregnancies terminate before full term, owing, doubtless, to the great distention of the uterus, which is often as large at seven or eight months as in a simple pregnancy at nine months. The same labor generally suffices for the expulsion of both, though such is not always the case; for, after the first child is born, the uterus may retract upon the remaining twin, and leave it unexpelled for eighteen or twenty-four hours. A still longer interval, several months even, may separate the two parturitions; and it is upon such facts as these that some persons have improperly admitted the doctrine of superfœtation. A reference to the latter is, however, unnecessary to explain these observations, for the cause of premature delivery is dependent solely on the enormous distention of the uterus, because as soon as one infant is expelled the womb retracts, the cause of irritation no longer exists, and we can readily conceive that the gestation may continue on until term. A child born at seven months may live equally well with one delivered at the end of pregnancy.

The peculiarities just studied in twin pregnancies may also present themselves in cases of triplets, &c. Thus, in a case cited by Portal, after the delivery of the first child and its placenta, which were healthy, he was obliged to extract two others that had apparently been dead for a long time, and were thoroughly dried.

Again, the membranes are not always disposed in the same manner in these pregnancies; and on this head we may admit, with M. Guillemot, who has particularly studied the subject, four distinct varieties: thus, in the first, two ovules are fecundated, and each embryo becomes developed, and is surrounded by its own proper membranes; in the second, the ovule contains two germs, though each fœtus has but a single envelope, the chorion being a common membrane; in the third, both embryos are inclosed in a single cavity, which appears never to have been divided by any membranous diaphragm; and, finally, the last variety is met with when the ovule contains a second germ, and both become developed together, which gives rise to what are called monstrosities by inclusion. Adopting this classification as the basis, let us now proceed to the different modes of termination presented by these pregnancies, according to the species to which they belong.

1. In the first variety, both ovules are developed, retaining their proper membranes, the chorion and amnion; at first, each ovum has its own reflexed decidua, but generally that portion of the latter which forms the partition is very thin, and becomes absorbed as the gestation advances, and a single decidua then appears to envelop both.

The two chorions repose against each other, being only separated by some very fine areolar tissue, so that the children are divided by one very thick partition composed of four layers. The placentas are sometimes separate, though usually confounded with each other, or else are united by a kind of membranous bridge; but, notwithstanding the continuity of tissue, there rarely exists any vascular communication between them, and this fact is so uniform that the exceptions to the law are very rare indeed. From all which it must therefore be evident that two distinct ovules have been fecundated, whether they are deposited separately, or are contained in the same vesicle. The first variety is the most frequent.

2. In the second variety of compound pregnancy, the chorion is common to both twins, and each fœtus has but a single envelope formed of the amnion—the two laminæ of which, resting against each other, constitute the median partition. MM. Dance and Mancel have furnished an example of this variety in which there were but two children. Brendelius reports that a woman was delivered of two girls after three days' travail, but she died before the extraction of the third infant, which was found dead on opening her body; the placenta was single and very large, and the chorion had been common to all three, although each fœtus had a distinct amnion.

There is therefore only a single placenta, and a communication nearly always exists between the ramuscules of the two cords, as I have verified myself, on a placenta, which was presented by one of my former pupils, an Interne of the Ursuline Hospital, where he obtained it. In this, as in the preceding variety, one fœtus may die, the other continuing to live; but it is easily foreseen that an expulsion of the two children cannot take place separately.

3. Further, it may happen that the fœtuses are not separated by any partition, and are all shut up in the same amniotic cavity; and to the examples of this kind, already cited, I may add a case observed by my friend and colleague, Dr. Fournier. The two cords arise, most frequently at least, from a distinct point of the placenta; but sometimes they are observed to come from a common trunk, which bifurcates at a variable distance from the placental surface. In this variety, the expulsion of one fœtus must evidently be followed by that of the other; but I do not know to what extent we can justly say that the death of one necessarily endangers the other's life, if not speedily delivered by nature. (Baudelocque.) This inclusion of two fœtuses in the same amniotic cavity is often met with in those cases where one of them is destitute of an important part of its body: thus, the monstrosity that I presented to the Royal Academy of Medicine was inclosed in the same sac with its twin brother.

But it is nearly or wholly impossible, in the present state of *ovological* knowledge, to explain this strange anomaly, the existence of which, however, has several times been clearly verified.

In accordance with what we have said respecting the formation of the amnion (see Art. *Ovology*), this membrane emanates from the embryo itself, and consequently the amniotic membranes should equal the fœtuses in number; but, without admitting the theory of Pockels and Serres on the development of the amnion, a theory which, notwithstanding its want of probability, derives, from the facts alluded to, a certain degree of support, we cannot explain them but by supposing that two amniotic membranes existed primitively, and that the partition produced by their contact has been somehow destroyed. Most generally, there are numerous communications existing between the umbilical ramifications, as we have stated, when the chorion, and especially the amnion, are common to both, which is not always the case. Thus, Dodd reports a case of triplets, where the placentas were consolidated into one, two of the children being inclosed in a common chorion, whilst the third had a special one; the umbilical vessels did not communicate with each other. In another instance, recorded by Davis, the three fœtuses had a common decidua; two of them were surrounded by the same chorion and amnion, but the third had its chorion and amnion distinct from the others; the placenta formed a single mass, but the vessels had no communication with each other. (*London Med. Gazette*, 1841.)

4. Finally, the fourth variety of compound pregnancy that we have admitted, along with M. Guillemot, constitutes what has been called a *monstrosity by inclusion*. It consists of the complete inclusion of the elements, whether more or less numerous, of one fœtus in the body of another fœtus, which is otherwise well formed.

M. Ollivier (d'Angers), who has published a very interesting article on this monstrosity, admits that the inclusion may take place in two different ways: for instance, the contained fœtus is sometimes shut up in the abdominal cavity of the other child, thereby constituting the *profound*, or *abdominal inclusion*. At others, it is merely enveloped by the integuments of the latter, which form an external tumor, without any communication whatever with the visceral cavities of the fœtus that carries it; this is the *cutaneous*, or *exterior inclusion*. This latter has again been subdivided into two varieties, according as the tumor occupies the scrotum or the perineum; but as the character of this work evidently prohibits me from entering into a discussion of the various opinions put forth as to the nature and the mode of formation of this kind of monstrosity, I can only allude to them here; and I refer for more complete details to the memoir of M. Ollivier (*Archives*, 1827), as well as to that of M. Lesauvage de Caen, and still more especially to the admirable *Traité de Teratologie*, by M. Isidore Geoffroy St. Hilaire.

PART III.

OF LABOR.

LABOR is that function which consists in the spontaneous or artificial expulsion of a viable fœtus through the natural parts of generation. The term *labor* is used more especially to designate the expulsion of the child; the expulsion of the placenta being treated of under the head of *Delivery*, of that organ.

This definition of labor, differing as it does somewhat from those given by most modern writers, has the advantage of furnishing me a basis whereon to found a practical division; for when the expulsion of the fœtus takes place from the efforts of nature alone, it is called a *spontaneous*, or a *natural* labor; but when nature is inadequate to the accomplishment of this effect, and art is obliged to intervene, the delivery is said to be *artificial, laborious*, and also (though improperly) *unnatural.*

This function has also received different denominations, according to the period of pregnancy at which it is manifested: thus, it has been named *legitimate, timely*, or *at term*, when occurring within a week before or after the expiration of the ninth month. On the contrary, it is called *premature* or *precocious*, if it takes place during the seventh, the eighth, or the beginning of the ninth month. Again, the latter may be spontaneous or artificial, according to whether it is simply the work of nature or has been brought on by the intervention of art. This last case should be carefully distinguished from what the ancients called *forced labor*, in which they not only provoked the manifestation of the uterine contractions by a more or less direct irritation, but effected the delivery at once.

Lastly, it is called *tardy*, or *retarded*, when the delivery is not accomplished before nine months and a half or ten months.

At whatever period delivery may occur, it is always effected under the influence of the same forces; though there is an important distinction to be established in the phenomena, constituting what practitioners are agreed to call the *labor.* Whenever we examine carefully the whole of those phenomena, we can readily make out two very distinct orders of facts. The one is nothing more than an expression of the vital action brought into play for the expulsion of the fœtus, while the other is constituted of the successive movements which the child itself executes during such expulsion; the first is purely physiological, the second embraces the mechanical phenomena of the labor. Though often confounded in practice, these two orders should be carefully distinguished in theory.

We shall therefore have to examine, in as many separate chapters, the causes and physiological phenomena, as also the mechanical phenomena both of labor properly so called, and of the delivery of the placenta.

Again, although in the vast majority of cases the woman is really able to deliver herself, yet there are many precautions which the accoucheur should bear in mind, and a series of little attentions he must give to the patient in the course of the parturition; besides, the child will likewise require his intelligent aid, either during the travail or immediately after its birth, and therefore we shall devote a chapter to the exposition of those attentions and precautions.

We shall, in the first place, enter upon the study of natural labor at term, spontaneous premature delivery, retarded labor, and natural delivery of the after-birth; leaving the subjects of difficult labor and preternatural delivery of the placenta, to be treated of hereafter under the head of *Dystocia.* Premature artificial delivery will be described in connection with the other obstetrical operations.

CHAPTER I.

OF THE CAUSES OF NATURAL LABOR AT TERM.

THESE have been divided into the efficient and the determining causes.

§ 1. EFFICIENT CAUSES.

For a long time the fœtus was regarded as the principal agent of its own delivery, and as the chick breaks the shell of the egg, so it was supposed to effect the rupture of the membranes which contained it. The advocates of this opinion, which is no longer admitted, except by some persons out of the profession, relied chiefly on the fact of dead children being expelled more slowly from the womb, and with more difficulty than others; and further also because, in certain instances, the child has been known to escape from the uterus some time after the mother's death. But, in reality, these two facts have no value whatever in the question before us; for the death of the fœtus, when recent, does not materially retard the parturition, and writers were altogether in error as to the influence attributable thereto.

The living infant is expelled more rapidly, not in consequence of being the agent of its own discharge, but because its movements irritate the uterus and solicit its more frequent contractions; after its death the organ is, on the contrary, deprived of that natural irritant. Besides, whenever the fœtus has been defunct for a long time, another cause of retardation is added to the former; for where the product of conception has undergone a partial decomposition, the contractility of the uterine walls is unfavorably influenced thereby. In fact, the vitality of the organ seems to be in relation, to a certain extent, with that of the inclosed body; the blood being no longer attracted thither by the ordinary stimulus, does not reach there in such large quantities as before, and consequently the greater vital activity usually manifested in gestation is lost; hence arise atony of its walls, an excessive feebleness of its contraction, and slowness of the labor. Again, the fœtal trunk, being softened by the changes before described, collapses, as it were, and ceases to offer that resistance to the uterine wall which is necessary to the energy and the maintenance of its contraction. Therefore, if it be true that the death of the infant renders its delivery more difficult, it is solely from the unfavorable influence that this occurrence may have over the exercise of the organic contractility.

Instances of children having been delivered spontaneously after the mother's death are quite numerous, and this is the strongest argument adduced by those who believe that the fœtus is the principal agent in the expulsion. But numerous observations, among others those related by Dr. Planque (in *La Bibliothèque de Médecine Choisie*), prove that those infants were dead even before the mother. Now these facts, extraordinary as they appear, can be very naturally explained as follows: Supposing the delivery took place shortly after the parent's death, the motor faculty of the uterus is not so dependent on the nervous system as to be entirely lost immediately upon the cessation of vitality in the latter, and is evidently retained for some time after the mother has succumbed. Thus, Leroux has observed the uterus contract a quarter of an hour after the last breath; and Osiander, after having performed the Cæsarean section on a corpse, found the uterus as much contracted the next day as it usually is in a woman just after her confinement. It is, therefore, very natural to suppose that such deliveries are owing to the contractile action of the womb, which, says Desormeaux, it, like other hollow muscles, still preserves for some time after death;[1] and finally, let us add, that the real death in many cases may have been preceded by an apparent one, and possibly that the former may not have occurred until just at the instant of, or immediately after the delivery took place. But when the expulsion of the fœtus did not occur before the lapse of two or three days, we must suppose, with M. Velpeau, that the labor was well advanced at the time of the mother's death, and gas being rapidly produced in large quantities in the intestinal canal, the uterus was thereby mechanically compressed on its exterior, and the ovum consequently forced out entire. Perhaps the subjoined case, reported by Hermann, might be explained in that way. (*Edin. Med. and Surg. Journal*, New Series, No. vi. p. 431.)

A young woman died in her tenth month, and the third day after, the attendants noticed a strange noise about the corpse. A physician was hastily summoned, who found that twins, still inclosed by the intact membranes, had been just delivered. The children presented no traces of putrefaction, the placenta alone showing a commencing alteration.

---

[1] Dr. Tyler Smith states that the reflex action may continue for some time after the complete cessation of the respiratory movements, and in some cases be powerful enough to effect the delivery when the patient has died during labor; but that, in most instances, the *post-mortem* expulsion of the fœtus is due to a peristaltic contraction of the uterine fibres. We find it difficult to admit the existence of a vermicular contraction powerful enough to produce such a result.

M. Brown-Séquard has recently advanced what he regards as an explanation of this posthumous contractility. According to this learned physiologist, the contact of venous blood with the muscular fibre is sufficient to stimulate it to contraction. I have observed, he says, movements in the uteri of recently killed animals, whose spinal marrow had been destroyed throughout its length. I have seen these same movements in the uterus extracted from a living animal. These, which could not be attributed to reflex action, since there was no opportunity for the exercise of nervous influence, were due simply to the contact of non-oxygenated blood, to prove which he relates the following experiment. The spinal marrow in two Guinea-pigs, which had reached the end of gestation, was destroyed from the sixth rib to the sacrum, yet labor began and ended shortly after a ligature was drawn tightly around the trachea.

But, besides these, numerous other objections still remain against this theory: 1. The delivery exhibits nearly the same phenomena, at whatever period of gestation it takes place; now, can any one suppose that the fœtus, which scarcely moves at all in the early months, can at once acquire a sufficient degree of strength to overcome the great resistance made at that time by the uterine neck? 2. It is well known, that, if the child present by any other part than the head in labor at term, the presenting part is so high up, before the rupture of the amniotic pouch, that it can in no wise contribute to the dilatation of the os uteri. 3. Again, the fœtal efforts certainly ought to affect the bag of waters first, and therefore a rupture of the enveloping sac should always be among the earliest phenomena of the labor; however, such a rupture often does not occur until the very last moments; sometimes even the ovum escapes entire. 4. Would it be possible for the most healthy and vigorous infant to make any exertions strong enough to surmount the resistance opposed to its delivery in some of the instances of tedious labor? &c., &c. From all which we may conclude that the fœtus has no influence over its own expulsion, and that the efficient cause of the delivery evidently belongs to the contraction of the uterine walls, aided by that of the diaphragm and the abdominal muscles.

Furthermore, to be convinced that the womb acts the principal part in this process, it is only necessary to examine a woman during labor, and, more especially, to introduce the hand into the uterus in a case of difficult version. It is its contractions alone which generally produce the dilatation of the os uteri, thus preparing a way for the child's passage; and they also perform the most important part in the later periods of the labor. They are even capable of effecting the delivery themselves. Thus, for instance, the parturition does not the less take place in animals, where the belly is laid open, and the abdominal walls thereby rendered incapable of any further action. It also takes place in women affected with procidentia uteri,[1] as also in those who suffer from a paralysis of the abdominal muscles, in consequence of an affection of the spinal marrow, or some one of the nervous centres. Finally, the use of anæsthetics within certain limits, destroys the contractility of the voluntary muscles, together with the sensibility; yet the uterine contractility remains, and the delivery is accomplished. Ordinarily, however, in the second or expulsive stage of the labor, the uterine contraction is assisted by the simultaneous action of the diaphragm and abdominal muscles.

At the moment when the head clears the neck of the uterus, especially when by pressing strongly upon the floor of the pelvis it distends the perineum, compresses greatly the lower part of the rectum and neck of the bladder, and opens and dilates the vulva, the pressure upon these parts is so violent that instinctively, not to say involuntarily, the woman exerts herself powerfully, in order to relieve herself as soon as possible from the insupportable sensation. Thus, fixing her feet firmly against the foot-board of her bed, and clinging to anything around that may offer a solid resistance, the patient takes a full inspiration, dilates her chest, and then, retaining the inhaled air in her lungs, she strongly contracts all the muscles forming the abdominal inclosure. This auxiliary contraction is so evident that nobody can doubt it, and authors only differ as to the kind of aid it brings to the uterine forces. Haller and others considered the uterine contractions as being merely secondary, and attributed to the abdominal muscles the principal part in the expulsion of the child; thus they suppose that the contraction of the organ simply serves to support the fœtal trunk, to embrace it properly like a cylinder, and to prevent the great pressure of the diaphragm from crushing it in, while at the same time the act of inspiration and the contraction of the abdominal walls force it outwards. But, from the facts before stated, we may judge of the value of this hypothesis. True, in certain cases of excessive feebleness of the uterus, and of a complete inertia of its walls, the abdominal muscles have proved sufficient to terminate the delivery; yet how much oftener has it happened that the woman, exhausted by antecedent disease, and left without energy or strength, has been unable to assist the womb by any voluntary contraction whatever!

---

[1] According to the report of Burdach, Wimmer has actually known the labor to take place regularly in a woman whose womb formed a tumor between her thighs, eleven inches long and seven and a half inches broad; the opening in which was directed downwards.

Again, some women have been delivered during hysterical or epileptic fits, in a state of total loss both of feeling and movement, where evidently the uterine contraction alone could accomplish it. This harmony of action is therefore useful but not indispensable, since the labor will often terminate under the sole influence of the uterine forces; but it will be nearly always impossible in cases of total inertia of the organ, however powerful the contractions of the abdominal muscles may be.

The researches of Cloquet and Bourdon on the physiology of the process do not warrant the supposition of any active pressure by the diaphragm on the upper part of the uterus. They have proved, in fact, that the principal phenomena consist in a change of the acts of respiration, and that the object of such change is to furnish a solid point of insertion to the muscles passing from the chest both to the trunk and upper extremities. When the air has penetrated into this cavity, the glottis closes spasmodically; the abdominal muscles begin to contract; they press back the viscera, in the cavity of the peritoneum against the diaphragm; the latter contracts in turn; and, being sustained above by the resistance from the air contained in the lungs, gives to the base of the chest a degree of immobility and solidity, which affords a fixed point for the muscles inserted there; so that, in the effort of expulsion, the diaphragm, by its contraction, only exhibits a power of resistance sufficient to sustain the thoracic parietes, but not an active force, which is to operate, like the abdominal muscles, directly on the uterus.

On the whole, then, the efficient cause of labor is inherent in the womb itself. Its contraction alone is brought into play during all the first half of the labor; but it is aided in the second period by the abdominal muscles, which become more and more active as the labor draws towards its termination. Most generally the uterine contractions would be sufficient, but the abdominal contraction alone could scarcely ever complete the delivery.

§ 2. Determining Causes.

This name is applied to everything that can determine the action of the efficient causes; and, as before stated, this class consists both of unnatural and natural causes. The second only claim our attention here. The regular and almost fixed period at which the gestation terminates in the majority of women, has, in all ages, claimed the attention of physiologists. By some, the determining cause of labor has been attributed to the child, and by others to the womb.

1. According to the partisans of the first opinion, the fœtus, having arrived at a certain stage of development, will have acquired such a degree of muscular power that the resulting movements of its limbs will produce such blows and shocks upon the uterine walls, as will irritate the organ and determine its contraction. 2. The weight of the infant might also lead to the same effect. 3. Being confined in the uterine cavity, whose dimensions have not augmented in proportion to those of the fœtus, the latter will be incommoded. 4. Suffering from the prolonged accumulation of meconium in the intestinal canal, of urine in the bladder, and from its contact with the amniotic fluids, which ultimately acquire acrid and irritating properties, and no longer finding in the materials furnished by the mother the elements necessary to its nutrition and respiration, the infant will experience a necessity of changing its residence, of seeking a medium more suited to its ulterior development; which necessity will prove an instinctive desire of escaping from the surrounding inconveniences, that will cause it to give itself, so to speak, the signal of departure. Surely, it is only necessary to present such reasons as these in a summary manner, to obviate the necessity of refuting them. In short, the fœtus is as foreign to the determining as to the efficient cause of labor. The opinion favorable to the cause residing in the uterus rallies around it a greater number of partisans, but all of these do not explain the mode of action in the same way. Thus, according to some, the womb only possesses the faculty of distention to a certain degree, and, when carried beyond that limit, the walls react and contract; others believe that the term of nine months is assigned by nature for the fulfilment of the new organization of the womb; and having acquired at that period all the qualities necessary to the accomplishment of the great function to which it is destined, it immediately enters into action. But most of the modern accoucheurs consider the following explanation as the more reasonable.

Observation proves, say they, that the fundus and body of the uterus are the parts first distended, for the purpose of forming the cavity which incloses the product of conception; and the cavity of the neck subsequently participates in the dilatation, which begins at its upper part, then gradually descends, so that the ring formed of the external orifice has alone undergone but little alteration at the approach of labor. Again, the walls of the neck, whose tissue is denser and more resistant than that of the body, undergo certain changes, which follow the same progression in dilating as the cavity does; their tissue is saturated with juices; they soften and become supple; their fibres unfold, as it were, are elongated and developed; and, consequently, the resistance of the neck to the escape of the ovum progressively diminishes as the term of gestation draws near.

According to this view, the fibres of the neck are considered antagonistic to those in the body, the contraction of which latter is therefore reduced to a simple tonic action, so long as the resistance of the neck is superior to their power; but when this opposition is diminished by the progressive dilatation of the cervix, the orifice alone remaining, the fibres of the body then begin to act more evidently, and their contractions become more and more energetic. (*Dict. de Méd., en* 25 v.)

According to Ant. Petit, the body only will dilate prior to the sixth month; but at that period it commences borrowing from the cervical fibres the elements of its ulterior distention, to which it can no longer contribute itself; and such contributions will continue to be drawn during the last three months, and then, when all the fibres held in reserve by the neck shall have yielded, the distention being carried to the utmost, the accouchement will take place. M. Velpeau adopts nearly the same opinion. On the other hand, M. P. Dubois, who originally advocated the opinions avowed by Desormeaux in the first edition of the *Dictionnaire*, has since taught, in his course of 1837–8, the following theory proposed by Jones Power, in 1819.

The uterine tissue at term may be justly compared to that of the other hollow muscular organs: the bladder or rectum, for example; and, like these organs, it is formed of two muscular layers, the external of which has longitudinal fibres, and the internal has circular ones; it also presents a superior cavity, a dilatable and contractile reservoir, to which the structure just indicated principally belongs; as also a closed orifice below, formed solely by the circular fibres arranged as a sphincter muscle. It likewise resembles the bladder and rectum in having two orders of nerves — the sympathetic and the spinal; those coming from the ganglionic system are distributed to the body, while the others, derived from the nervous centres of animal life, go to the neck, which is a true sphincter for the uterus; the similitude is further maintained by the presence of a membrane lining its interior, and by being covered externally, though at the superior part only, by the peritoneum.

The agreements in structure are not the only ones claiming our attention; for the well-marked sympathies existing in the rectum or bladder, between the reservoir and its sphincter, are found quite as distinctly marked between the body of the uterus and its neck; for as an irritation of the neck of the bladder or the sphincter ani is capable of producing an urgent desire to urinate, or to go to stool, so irritations affecting the cervix uteri also solicit the contractions of that organ; moreover, it is well known that an extreme fulness or distention of the first-named organs acts mechanically in two ways: 1. By irritating their walls by the direct contact of the contained substances; 2. By dragging or pressing on the fibres forming the sphincter, and these latter reacting on those of the body. Now, who does not recognize in this resemblance, says Dubois, an easy explanation of the determining causes of labor? For, so long as the cervix uteri retains a certain length, its most inferior fibres, those especially supplied by the nerves of animal life, and therefore enjoying a high degree of sensibility, are not exposed to any kind of excitation; but, towards the end of the gestation, and in consequence of the successive expansion at the superior part of the neck, its whole length has disappeared by contributing to the gradual development of the organ; a circular collar alone remaining, formed of the horizontal and the circular fibres, which appertain to the external orifice. The growth of the uterus cannot continue without producing a severe tension on the fibres of this collar; and further, being brought immediately into contact with the amniotic sac, and consequently with the presenting part of the fœtus, they must necessarily suffer, must be irritated and excited by this constant and unusual contact. As this double cause of irritation is constantly acting, it must inevitably happen with the fibres belonging to the body of the uterus, as it does with the rectal and vesical walls when their sphincter is irritated, *i. e.* they must immediately enter into contraction.[1]

Dr. Tyler Smith, of London, has lately endeavored to prove, in accordance with the observations of Carus, Mende, and Merriman, that the determining cause of labor must be sought for in the ovary; that natural labor always corresponds with the tenth menstrual period, and that the congestion of the ovaries produced, by reflex action, first a simple irritation, and ultimately true contractions of the uterine parietes.

Admitting as proved that the menstrual ovulation goes on during pregnancy, it would still remain to be shown why it should be rather at the tenth than at the eighth or eleventh period that this influence of the reflex action of the ovary should be strong enough to excite the contractions of natural labor in the uterus.

At one of the late sittings of the Biological Society (September, 1855), M. Brown-Séquard suggested a theory which doubtless is subject to objections, but which certainly is one of the most ingenious of all that have yet been proposed in reference to the determining cause of labor.

Like all the muscles, those especially of organic life, the muscles of the uterus are very sensitive to the contact of venous blood, and the carbonic acid gas, which the latter contains in large amount, is capable of producing their contraction. Of the experiments tending to prove this, one certainly seems very conclusive. M. Séquard applied a ligature to the trachea of a pregnant rabbit. Six or eight minutes after the commencement of asphyxia, uterine contractions became manifest; the ligature was removed, the contractions ceased; it was again applied, and they reappeared.

---

[1] Mr. Power cites the following case, communicated by his brother in support of his opinion, and which we bring forward as being interesting in many respects.

A lady, the mother of several children, supposed herself near the term of a fresh pregnancy, and she felt two or three slight pains; but they soon passed off again, and three months more elapsed without her experiencing any other pain. Becoming uneasy about her condition, she consulted several physicians, who, after having made the usual examination, declared she was not pregnant. The author's brother having been called in, participated at first in the same opinion; nevertheless, he found the abdomen greatly enlarged, and much inclined forwards, so that it descended in front of the thighs, almost down to the knees, when the patient was standing. A distinguished physician, a friend of the lady, who was present, then mounted on a chair above her, and by passing a towel underneath the belly raised it up; the vaginal touch being once more resorted to, the child's head was distinctly felt. A suitable bandage retained the tumor in that position, and four or five days afterwards the pains came on, and the woman was happily delivered of a very large living infant.

Now, according to M. Brown-Séquard, at the end of gestation, the irritability of the uterine fibre is very great, and the development of the venous apparatus of the organ such, that a considerable amount of venous blood is contained within its walls. These two conditions together constitute, he thinks, the determining cause of the first contraction, since the excitability must necessarily be awakened by the prolonged contact of carbonic acid. The effect of the first contraction would be to expel the blood from the veins, and the contractions would cease promptly with the exciting cause, did not the pain which it occasions stimulate the reflex action of the spinal marrow; the latter, therefore, sustains it for some moments. But, as we shall state hereafter, the contractile power of a muscle of organic life is rapidly exhausted, its fibre relaxes, and repose soon succeeds to activity. This relaxation of the uterine fibre allows the venous blood to flow back into the uterine sinuses, so that after a time the series of phenomena just mentioned recommences.

I have contented myself with simply presenting the principal views that have been entertained as to the determining cause of labor, although it would be an easy matter to start numerous objections against all of them, which perhaps could not be set aside. Thus, the uterus is as much distended, in some cases, at eight months as it is in many others at nine, without the term of pregnancy being anticipated. The muscular organization of the uterus is as perfect several weeks before the two hundred and seventieth day as it is at a later period. The sort of antagonism fancied by some authors to exist between the fundus and the neck of the uterus, is a pure hypothesis unsupported by evidence; besides, this opinion, like that of Antoine Petit, rests upon a false observation, namely, that of the progressive shortening of the neck after the sixth month.

[It is universally admitted that delivery is effected by the contraction of the uterus, but the question has been raised, Why does this contraction take place at the end of gestation? On this point, Power's theory seems to have gained the assent of the majority of accoucheurs. It does seem to us, however, that the question has been badly put, for how can we believe that the muscular fibres of the uterus *do* remain inactive for nine months, and enter into contraction only at the termination of pregnancy? We feel justified in asserting that the uterus contracts throughout the entire period of gestation, feebly at first, and rarely, it may be, but more decidedly as the time progresses, so that it may not infrequently be detected by palpation of the abdomen at various periods.

The contractions are, doubtless, very slight at first, though real, and every one knows that they accomplish the effacement of the cervix at the end of gestation. Should an accidental cause increase their energy prematurely, the result is either abortion or premature delivery.

We would therefore reverse the question and ask why, if the contractions take place throughout the entire period of gestation, do they expel the ovum only at term? The first reason to be adduced is, that the contractions, though feeble and insufficient at the outset, grow stronger as the development of the middle layer of the uterus progresses, but not until the end of the ninth month have the muscular fibres acquired sufficient contractility to effect the expulsion of the child. In the second place we would add, that the contractions which occur during the course of gestation, make a fruitless effort to dilate the firm and resisting tissue of the uterine orifice.

It is, therefore, by a wise precaution of nature that the softening of the cervix, which takes place from below upwards, reaches the internal orifice only after the expiration of the eighth month. The internal orifice then yields to the contractions which produce the gradual effacement of the neck from above downward. The term of gestation has now arrived, and the contractions increase greatly in strength. At this point only, would I have recourse to Power's theory, which seems to afford a true explanation of the recrudescence of the contractile forces of the womb and the prompt establishment of labor.]

CHAPTER II.

OF THE PHYSIOLOGICAL PHENOMENA OF LABOR.

For the purpose of facilitating the study of the phenomena of labor, most writers have divided them into several distinct groups, which they have denominated the *stages* of labor; and each one has built up his own classification, so that we may now enumerate some twenty or thirty. Of all these, the division of Desormeaux appears to us the most simple, and we shall therefore adopt it. His first stage extends from the beginning of the labor to the complete dilatation of the cervix uteri; the second includes all the interval from this time until the child is expelled; and the third embraces the delivery of the placenta.

Precursory Signs.—The *term* of gestation is most usually announced by a collection of symptoms, to which the majority of authors have applied the name of the "precursory signs of labor." Thus, during the last fortnight of pregnancy, sometimes a little sooner, at others, only five or six days before the delivery takes place, the uterus, which previously extended up to the epigastric region, sensibly sinks lower, and seems to spread out laterally; and the mechanical obstruction to the respiration being thus removed, the latter becomes more free; the stomach is no longer compressed, and digestion, if hitherto impaired, becomes more easy; the patient, no longer troubled with nausea and vomiting, and respiring more freely, becomes, it is said, gayer, more cheerful, and disposed to movement. However true this last proposition may be with regard to some women, it certainly does not apply to all; but, on the contrary, it has seemed to me that in proportion as the term approaches, their position becomes more and more distressing; and this, I think, may be easily explained; because if the respiration becomes more free, and the fundus uteri descends, the inferior part of the organ must also sink down in the same ratio. The head, when presenting, engages in the excavation, carrying the lower portion of the uterus before it; it sometimes even reaches the pelvic floor, and consequently gives rise to an annoying sensation of weight about the fundament, to great pressure on the neck of the bladder and rectum, strainings at stool, ineffectual desires to urinate, vesical tenesmus, dysury, and sometimes even to strangury; the œdema and varices of the inferior extremities and genital parts then augment considerably; the hemorrhoidal vessels swell up, and the tumors of the same name, if they existed before, become more voluminous and very painful; at the same time copious glairy discharges escape from the vulva.

About the same period the pelvic ligaments become softened, and the gliding of the articular surfaces being rendered easier, the joints are more movable, and consequently walking is uncertain, painful, and sometimes even impossible. Lastly, to all these inconveniences and pains, another is often added, which singularly aids in making the woman's condition still more distressing; it is this: the uterus, in the last periods of gestation, seems, by contractions, which are short and distant at first, but soon increasing both in length and frequency, to prepare, as it were, for the more violent contractions of parturition. Indeed, she often experiences the true pains from time to time, and should the accoucheur then examine the abdomen, he, like her, will feel it hardening, and the uterus manifestly contracting. At times, these contractions are scarcely painful, are not attended with bearing down, and can only be detected by placing the hand upon the abdomen.

We know that the uterine globe is contracting, from its greater hardness; then, after a short time, relaxation occurs, and the walls regain their habitual suppleness.[1]

In women who have previously had children, we ascertain by the vaginal touch, that the membranes bulge out during contraction, and engage slightly in the upper part of the cervix uteri. These precursory phenomena are manifested much sooner in primiparæ than in others.

According to certain writers, the pains are felt first, and with more severity than at any other time, about four weeks before term; so that some women, who have been pregnant before, do not hesitate then to affirm that their labor will take place in the course of a month. (Burdach.)

Further, these pains are not wholly useless, for they tend to diminish the thickness of the neck, and generally bring on its dilatation; thus, I have remarked that, when no cause of dystocia existed, the labor was usually much more rapid in those females who had been thus tormented by frequent pains during the last fortnight of their pregnancy.

On the whole, therefore, contrary to the proposition reiterated in all the classical works, that *women are more gay, cheerful, and disposed to action*, I have observed that they are in general more sad, and are greater sufferers, than at other times; and although they appear to endure their pains better, it is simply because they are encouraged by the hope of a speedy delivery, the announcement of which is recognized in the very sufferings they endure.

---

[1] These contractions, which are the precursory symptoms of labor, I regard as due to the changes which the upper part of the neck undergoes in the latter weeks of gestation. We have already stated that, in the last fortnight, the internal orifice softens and yields to distention, then expands from above, so that the upper half of the neck gradually becomes confounded with the cavity of the body; the lower part of the ovum will evidently engage in the dilated portion, and soon come in contact with the parts in the neighborhood of the external orifice. This contact occasions a progressive irritation of the irritable fibres of the lower half of the cervix, which, by reacting upon the body, excites its contractions, until finally, the entire neck being effaced, the irritation reaches its maximum, and labor commences.

First Stage.—The term of gestation finally arrives, and the labor begins. In primiparæ, this is made known by the opening of the neck, which until that time had remained closed; and in other women, by the total effacement of the rounded collar presented by the os tincæ. The pains just mentioned as occurring in the last fortnight of pregnancy, suddenly become more acute and frequent, and while they last the abdomen retracts, and the uterus hardens, as may easily be verified by examination. If the fundus was heretofore inclined towards the right or the left, it will now return to the median line; the inequalities of the fœtus can no longer be perceived through the abdominal wall; the cervix uteri, which is already somewhat dilated, closes partially during the pain, and its margins are tense and resistant, though growing thinner; the membranes are distended, press at first on the neck, then engage in it as soon as the dilatation is sufficiently advanced, under the form of a segment of a sphere, whose dimensions progressively increase with the dilatation.

The organs of generation are more humid; the glairy discharges are streaked with blood; the pains continue to increase in force and frequency, each one being ushered in by a slight shivering, or horripilation; while it lasts, the pulse is hard, frequent, and full; the countenance is flushed, the surface and tongue dry, and the patient very thirsty; nausea and vomiting often come on; she weeps, desponds, and becomes quite irritable, and, being unconscious of the progress of her labor, because no advance is perceived, she cries out repeatedly, that she will never get over it. After the contraction, she is less agitated; still, however, the cessation of the pain does not seem to be perfect, the calm is not yet complete, and the poor sufferer, still under the influence of the last pain, dreads incessantly the arrival of its successor. During the interval, the margins of the os uteri again become supple, thick, and rounded; the membranes that were smooth and tense, while the pain lasted, are now flaccid, and hang in folds, and the fœtal head, which was temporarily removed from the orifice, seems to return, and is much more accessible to the finger. In proportion as the contractions are repeated, the os uteri gradually dilates more and more, until at last it is completely opened; the cavity of the uterus and the vagina thenceforth forming but a single uninterrupted canal.

Some females are able to conceal these early pains, but most of them find it impossible to do so for any length of time; for, if conversing, they will at once leave the phrase incomplete, and remain silent until the pain has diminished or stopped altogether; or, if they happen to be walking up and down the chamber, they stop short and lean on a chair, or the first article that comes to hand, until it passes over.

The occurrence of violent shivering, and sometimes of general tremors, at the termination of this stage, is by no means unusual, and that, too, without any sensation of cold being perceived. The patient herself frequently expresses surprise at her trembling. It is doubtless caused by one of the singular impressions produced upon the nervous system by the act of parturition.

Second Stage.—At length, under the influence of these first pains, the duration of which is very variable, the orifice is enlarged until it forms a sufficient opening; and from that moment all the uterine forces are directed to the expulsion of the foreign body contained within the organ. Up to this time, the uterus alone was concerned in dilating the neck, but it now seems to call in aid the contraction of the abdominal muscles, and consequently both the pain and the bearing down are carried to a much higher degree. The heat of the surface is much more considerable, the agitation extreme, and in some instances there is even a marked disorder in the intellectual functions. The pains are stronger, and the intervals shorter; nevertheless, the woman bears them with more patience, nay, she even assists them by voluntarily contracting all the muscles of the trunk; and each pain is followed by a calm more perfect than that in the first stage. Indeed, when the interval is rather long, some females, exhausted by the previous fatigue, sleep profoundly, and thus get a refreshing repose that should be respected, but which is soon interrupted by a new pain. The inferior segment of the membranes gradually engages in the orifice; the successive and repeated contractions cause the liquor amnii to flow towards this point; the amniotic pouch becomes tense and bulging at its lower part, and, being entirely unsupported by the parietes of the neck, it gives way, and the contained waters escape with more or less rapidity and abundance, according to circumstances.

Immediately, the fœtus, urged on by the same contraction, applies itself to the os uteri, and the head, if that is the presenting part, engages like a stopple in the orifice, thereby preventing a further discharge of the waters. The head is then said to be *at the crowning.* The rapid discharge of a considerable quantity of the waters, which then takes place, suspends the uterine contractions for several moments, and, as the head no longer presses on the circumference of the neck, a small amount of fluid is again discharged. But a more energetic pain shortly comes on, by which the child's head advances and clears the circle of the uterine orifice, and just at this moment the patient very frequently gives a loud cry, an expression of the great pain caused by its passage. Next, the head descends into the vagina, the transverse folds of which become effaced, the canal enlarging and elongating for its reception. When a rupture of the membranes takes place before the os uteri is completely dilated, the head often descends to the pelvic floor, though still retained in the womb, and does not clear the uterine orifice until it engages in the inferior strait; though, whichever happens, the pains go on increasing in violence. Each one is announced by a general shivering; the patient clings to anything around her, supports her feet against the mattress, throws the head backwards, takes a deep inspiration, and violently contracts all the muscles of her body. The fœtal head, being thus forcibly urged on, presses against the floor of the pelvis, and causes it to protrude at every pain; and the consequent pressure on the rectum gives rise to illusory desires of going to stool.

After a greater or less resistance, the perineum at last yields, becomes distended and bulging in front; the vulva partially opens, and the nymphæ are effaced, the skin in the neighborhood contributing to the enlargement; the head then appears in the dilated vulva, and the fæces as well as the urine are passed involuntarily; then the pain again ceases; the head, just apparent, now seems to re-enter the excavation; the overdistended perineum retracts from its own inherent elasticity; the labia externa approach each other, and the vulva again closes up; at each pain, the latter opens more and more, then retracts, until, at last, all these parts, from the force of the repeated contractions, become incapable of any further resistance;[1] finally, a horrible pain comes on, forcing loud cries from the woman, which is made up of two others of unequal violence, for which nature seems to have reserved all her powers; this first brings the parietal protuberances to a level with the tuberosities of the ischium, and then expels the head altogether from the parts.

In some instances, the delivery of the body immediately follows that of the head; but in the larger number, some seconds elapse; then the pain is renewed, the uterus again contracts, and drives out the fœtal trunk, together with the rest of the amniotic liquid.

The rapid sketch of these phenomena, just given, has not afforded us an opportunity of dilating upon any of them; nevertheless, some ought to be studied more carefully. For instance, the pain, the dilatation of the uterine orifice, the glairy discharges, and the rupture of the membranes, demand a more particular attention. We shall, however, be brief in the physiological considerations appertaining to each.

§ 1. The Pain, or Contraction.

In most females, the pain is so inseparable from the contraction, that, in common language, the cause is readily confounded with the effect, and the two expressions are used, indifferently, to express the uterine contraction, its returns, duration, weakness, and intensity. We must remark, however, that although the intensity of pain is generally in relation to the contraction, yet it is not always so, for the perception of pain thereby produced necessarily varies with the susceptibilities of the patient herself. Some experience trifling pains very acutely, and express themselves freely; others, on the contrary, whose sensibility seems more obtuse, scarcely complain at all of the strongest contractions. Again, there are certain females who have the happy privilege of being delivered almost without any or at least with but very inconsiderable pains. For instance, I had an opportunity of observing a young primipara at the Clinique, who was aroused by the pains at four o'clock in the morning, and was delivered at six; she suffered so little during these two hours, that she did not consider it necessary to alarm any one, and the midwife was only summoned when the pain became a little more severe; she soon arrived, and found the head delivered. This case was still more remarkable, from the fact of a partition existing in the vagina, which divided its cavity into two parts; indeed it had been proposed to incise this septum when the hour of labor should arrive.

---

[1] Certain authors attribute the retreat of the head after each pain to a winding of the cord around the child's neck, and therefore propose various measures for facilitating its delivery. But this simply results, says Baudelocque, from the elasticity of the perineum and the reaction of the muscles contained in its substance, as also from the elasticity of the cranial bones. Consequently, we have nothing to do but to await the spontaneous expulsion.

It is highly probable that the dilatation of the neck goes on quietly in such cases, under the influence of contractions which are not perceptible to the patient from being unattended with pain. The pains have received different names according to the period of their occurrence: thus, the trifling ones appertaining to the precursory phenomena of labor are named *mouches*, from a comparison with the sensation caused by the pricking of a fly; those of the first stage, in which the neck is dilated, are termed *preparative;* those of the second are designated as the *expulsive;* and finally, in the last moments of labor, when the head forcibly distends the perineum and partially opens the vulva, the pains are so violent in character as to have been denominated the *conquassantes.*[1]

The pains are felt in the lower part of the abdomen; and in the early stages, generally follow a line drawn from the umbilicus to the second bone of the sacrum, but when the head presses against the pelvic floor, they run more towards the coccyx. Sometimes they are felt in the lumbar and sacral regions only; the women then call them the pains in the back; and the patient has good cause for dreading them, for they do not much advance the delivery, and always leave behind them a feeling of discomfort and prostration. These lumbar pains often come on early in the labor, at other times a little later, but they rarely continue till its close; sometimes they coincide with a great obliquity of the uterus. According to Madame Lachapelle, they may generally be referred to too great a rigidity of the external orifice, either because this experiences a kind of cramp, or that owing to its unyielding condition it receives the full force of the uterine efforts, and consequently suffers more than when softened.

These lumbar pains doubtless depend on the sensibility of the orifice, and this can readily be explained by the origin of the nerves distributed to the neck, for the hypogastric and lumbar plexuses furnish them; whilst the ovarian plexus of the splanchnic nerve alone sends its branches to the fundus uteri. Various plans have been tried to assuage these pains: thus, venesection, emollient injections, and the opiates, have often succeeded; but there is one which, of itself, may suffice in many cases to relieve the patient, that is, to raise her up by passing a towel under the loins. The pains have been divided by writers into true and false, according to whether they are produced by a regular labor, or by some disorder in the uterine functions; but as we shall endeavor to establish the diagnosis carefully further on, we will only remark now, that a true contraction always commences in the fibres of the neck, and only reaches the fundus some seconds afterwards; and therefore every contraction beginning at this latter part is irregular and abnormal. (See chapter on *Attentions to the Woman during Labor.*)

---

[1] I give these terms (*mouches* and *conquassantes*) as found in the original, because, in our American practice, they have no synonyms; perhaps the words *pricking* and *tearing* would express their sense. — *Translator.*

The question now arises, what is the cause of the labor pain? Some suppose that it is produced by the tension of the fibres of the neck; others, by the pressure on the nerves distributed to the internal surface of the organ, which are necessarily compressed by the fœtal walls during the contraction; and lastly, certain accoucheurs have thought that it was owing to the compression of the parts contained within the pelvis: the nervous plexuses, for example. But these opinions err in being too exclusive, since all of these causes evidently contribute to the production of pain; indeed, there can be no doubt that the dilatation of the neck is painful during the first stage of labor, more especially when the head is clearing it, this being, according to Madame Boivin, almost the only source of suffering; though, on the other hand, when the child is so placed that it neither rests against the uterine orifice, nor yet on the superior strait, the contraction is still painful; and the pain must then be owing to the pressure on the nerves of the body of the womb. Again, in the last moments of parturition, when the head is passing the inferior strait, the perineum, and vulva, the enormous distention of those parts, and the pressure on each of them, must singularly add to the pain produced by the contraction, as well as contribute towards giving it that particular character known under the name of the *conquassante*, or tearing pain.

Without denying that these various conditions may be the first cause of the pain, M. Beau observes, that the suffering which they produce is not seated in the uterus, but in the lumbo-abdominal nerves. He regards the pains of child-birth as being, for the most part, a lumbo-abdominal neuralgia, precisely as though the case were one of pathological disease of the uterus. If, says he, a woman in labor be examined with the object of determining the existence of the five painful points which characterize the lumbo-abdominal neuralgia, there will then be found, as in disease of the womb, points which are painful on pressure in the lumbar, iliac, hypogastric, inguinal, and vulvar regions. In some cases, it is the lumbar point; in others, the inguinal or iliac, &c. Pressure on the same points is much less painful during the interval of the pains; in some cases, indeed, all tenderness then seems to disappear.

Though the localization of the pain in the lumbo-abdominal nerves may not explain its intimate nature and first point of departure, it at least enables us to understand the numerous varieties which it assumes; just as certain grave lesions, and some extensive displacements of the organ, are in some women attended with no pain, whilst with others a trifling disorder, or a slight displacement, gives rise to extreme suffering. Thus, some women suffer very little from powerful contractions, whilst others complain bitterly of the slightest expulsive effort. Here, as in the pathological case, it is impossible to fix a constant relation between the intensity of the abdominal neuralgia and the contractile action of the uterus.

The degree of pain, as M. Beau remarks, is owing here, as in all other neuralgias, to the nervous susceptibility of the female. We were, therefore, right in saying that the pain is not intimately connected with the contraction.

[The pain which accompanies the uterine contractions is not a unique fact in the organism, inasmuch as all rather severe involuntary contractions, in whatever organ they may take place, are attended with pain. I would mention in illustration, cramps in the muscles of the animal life, colic pains in the bowels, spasmodic contractions of the bladder, and palpitations of the heart. Under ordinary circumstances, it is true that the muscles of the limbs, of the intestinal canal, of the bladder, and of the heart, are constantly contracting without pain, but the moment they become affected with severe involuntary contraction, pain is experienced. This would seem to be a law of pathological physiology which is as applicable to the uterus as to any of the other organs. We believe, therefore, that the pains of labor have their seat in the uterine walls precisely as colic pains are situated in the walls of the intestines. The painlessness of the contractions which take place during pregnancy, is explained by their feebleness, and are comparable to the peristaltic motions of the bowels of which we are unconscious.]

Still another question has been agitated by physiologists, that is, why is the contraction intermittent? and here far-fetched reasons have been adduced to explain a very simple phenomenon; just as if any single muscle of the economy could contract permanently; as if it were not the nature of all muscular contraction to be interrupted by the fatigue of a too prolonged exercise, and as if it must not have an interval of repose, in order to preserve its activity. Besides, if the uterine contractions are dependent upon the nerves of organic life, why should they not be subject to the periodicity which marks the muscular apparatus supplied by branches from the great sympathetic? We are doubtless ignorant of the cause of the rhythmic intermissions in the contraction of the heart, as well as of the stomach and intestines; what cause is there, therefore, for greater astonishment at the intermittence of the uterine action, subject as it is to the same nervous influence?

It is certainly very curious to study the influence of the contraction over the mother's circulation, which exhibits, according to Holl, the following peculiarities during a pain. In general, the pulse is accelerated as soon as the contraction begins, increasing in frequency as it goes on, then diminishing, and gradually resuming the normal type. Now there exists so intimate a relation between these two phenomena, that, where the pulse is gradual in its acceleration, where it arrives little by little to the maximum of its rapidity, is there sustained for a certain length of time, and finally recedes by degrees, the pain also follows an equally regular course; it gradually attains its maximum intensity, remains a while stationary, and then decreases with the same regularity; but, on the contrary, if the pulse accelerates by jerks, the contraction will be short and precipitate, and therefore without effect. Holl ascertained this regularity in the phenomena, by counting the pulsations by quarters of a minute during the whole time a pain lasted. For instance, he noted the following variations in a contraction which lasted two minutes:

First minute,	First and second quarters, each, . .	18 pulsations.
	Third quarter, ...	20 "
	Last quarter, ...	22 "
Second minute,	First and second quarters, . . .	24 "
	Third quarter, ...	22 "
	Last quarter, ...	18 "

In proportion as the labor advances, the pulse accelerates the more; so that, a little while before delivery, it has the same frequency in the intervals as it had at first during the strongest contractions. We have already pointed out the modifications in the bellows murmur, noticed by the same observer during the pain, and shall not repeat them now, merely remarking, however, that they are sufficiently well marked to indicate the uterine contraction, even when the woman herself may be desirous of concealing it.

§ 2. Dilatation of the Os Uteri.

The fœtus evidently has no part in the dilatation of the os uteri until the bag of waters is ruptured. It is not until after this event takes place, that the vertex, by engaging like a wedge in the uterine neck, can hasten the dilatation mechanically; and it is equally evident that, in any other than a vertex position, the presenting part being more voluminous and irregular than the head, cannot perform the same office, and therefore, *cæteris paribus*, the orifice will open more slowly. Hence, it is not the fœtus, at least during the first part of the labor, which is the efficient cause, but here also the phenomenon is referable to the contraction of the uterine fibres.

Now, in order to understand how this occurs, we must remember, says Desormeaux, that the walls of the womb are applied to an ovoid body; that the longitudinal fibres are the most numerous, and that the circular fibres of the cervix, although capable of stoutly resisting their power, yet are gradually constrained to yield to the action of the longitudinal ones. If we now imagine these latter fibres to enter into contraction, we shall readily comprehend that, being unable to diminish the distended uterine cavity, all their power must be exerted in drawing upon those points of the circle which form the orifice, where each one is inserted, and thus remove them from the centre of the opening. Wherefore, every portion of the orifice being equally operated upon, it will present a circular form; but if the fœtus is placed transversely, and the womb dilated in that direction, the fibres being retracted more in the same diameter, the orifice will be elliptical.

The rapidity of the dilatation bears a direct ratio to the force and frequency of the contractions. In general, it is very slow in the commencement of labor, but much more rapid towards its close: for instance, if the opening dilated to the extent of one inch in four hours, it would only require two, or at most three hours for its complete enlargement; this progresses more slowly, however, in primiparæ than in other women. Again, the softness, or the rigidity and tension, of the neck during the intervals of pain, has a great influence over the rapidity of its dilatation; and the same may be said of the obliquity of the orifice; for when this latter is carried in front towards the pubis, or, what is still more frequent, is strongly directed backwards towards the sacrum—in either case, the neck is no longer placed in the axis of the contractions, and the head is forcibly pressed towards some part of the uterine wall, against which all the expulsive force is lost.

It is likewise important to bear in mind, that the posterior obliquity of the neck may be owing to an anterior inclination of the womb, and may also exist without the latter being at all changed from its normal position; this results from the head having been engaged a long time in the excavation, and having pushed the anterior inferior uterine wall before it; the os uteri being at the same time carried upwards and backwards.

[When the orifice is directed very far backward, it is sometimes difficult to reach, and some practitioners make the mistake of supposing that the dilatation is completed even when the head is entirely covered by the anterior segment of the womb.[1] This error is most liable to occur in first labors, for then the edges of the orifice are extremely thin, and when the head distends and presses down the lower segment of the uterus without interposition of the amniotic fluid, the sutures and fontanelles may be felt so easily as to lead to the supposition that the head is uncovered. A mistake of this nature may have serious consequences. I have myself seen attempts made to apply the forceps under these circumstances. To avoid misconception, the hips of the patient should be raised, the fingers passed very far back and moved over the contour of the head. If the orifice is really dilated, the finger will penetrate very deeply and pass alongside of the head without meeting any obstacle. If, however, dilatation has not been accomplished, the finger is soon arrested by the neck of the vaginal sac—especially in front.]

The orifice, which is generally very thin in primiparæ at the beginning of labor, becomes thicker towards the last half of the first stage; then it gets thinner, and finally forms a thick, rounded collar, which the head pushes before it as far as the inferior strait.

The reason of these various changes, says M. Guillemot, is very simple; for the pressure upon the neck acts more forcibly on the periphery of the orifice than on any other part, and the consequent thinning will disappear as soon as the uterine circle yields, and is carried back towards the parts that have not suffered an equal pressure, but have maintained their original thickness; though soon after, in consequence of fresh pains, the tension on this new circle will destroy its bulk and reduce it to the condition stated. Finally, a period arrives when the neck maintains its thickness, notwithstanding the dilatation it undergoes, because the uterine fibres, being excessively shortened, give more density to this part. I will add that the thickness of the anterior lip is often greatly augmented, when the engagement is far advanced, by œdema of the part, due to its compression between the head and the symphysis pubis; and further, that it is not at all uncommon to find the posterior lip quite thin, whilst the anterior one still remains considerably thickened.

§ 3. Of the Glairy Discharges.

We have already learned that an abundant secretion takes place in the vagina during the latter periods of gestation; but when the labor sets in, this secretion augments very considerably, and discharges of viscid mucus, resembling the white of an egg, designated as the glairy discharges, flow from the womb and vagina. In some women they become sanguinolent at the approach of the travail; but in others they are only so during labor. When blood is thus mixed with the other fluids, it is said to be an evidence that the dilatation of the orifice is advanced; this, however, is not always true, since, in some instances, several days elapse before the commencement of parturition. In some cases, indeed, they are wholly absent, and the labor is then said to be a *dry one;* the genital parts experiencing a degree of heat and dryness almost akin to inflammation.

---

[1] Sometimes the orifice is so thin that the finger slips over it without perceiving it.

With regard to their origin, these discharges are not, as Ant. Petit and Baudelocque supposed, the product of a transudation of the amniotic waters through the pores in the membranes; but they simply result from the more abundant secretion of the mucous cryptæ in the neck and vagina; a secretion which is augmented by the greater irritation in those parts, caused by the labor. As to the blood that colors them, whether before or during the labor, it may come either from some slight laceration in the borders of the orifice, from a rupture of some of the minute vessels which run from the internal uterine surface to be distributed upon the membranes, or from the detachment of a small portion of the placenta; or, according to Desormeaux, it may escape from the extremities of the capillaries without any discoverable rupture.

These mucosities, commencing as we have before seen in the latter weeks of gestation, serve to lubricate the genital passages, and while relieving the vaginal walls and the parietes of the neck from their engorgement, they have the further advantage of moistening those parts, of softening the perineum and the vulvar orifice, and thus rendering the extreme distention which all of them must shortly undergo more easy. Their abundance is always to be considered a good sign, presaging a prompt dilatation and an easy expulsion.

§ 4. OF THE BAG OF WATERS.

As the neck progressively dilates, the fœtal membranes present and become engaged therein, forming a tumor of variable size in the vagina, which is tense at the moment of contraction; and this is what is understood by the formation of the bag of waters. The sac varies in its shape with the figure represented by the uterine orifice; it is generally rounded and hemispherical, though ovoid when the cervix uteri dilates more in one diameter than another; when the membranes are formed of a loose, uncontracted tissue, and especially when they contain but a small quantity of liquid, they may form an elongated tumor in the vagina, without being a necessary sign of a presentation of either the hand or the foot, as some have incorrectly supposed.

We must acknowledge, however, that the bag of waters is usually less voluminous in vertex presentations than in others; and, consequently, that a very great protrusion of it nearly always announces an unfavorable position. This occasioned the remark of Madame Lachapelle: "I do not fear the flat sacs." As soon as the pain ceases the tumor disappears, the fluid that formed it re-enters the uterine cavity, and the flaccid, relaxed membranes hang in folds.

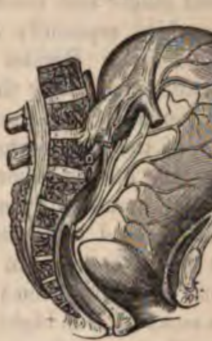
[The bag of waters, says Prof. Depaul, sometimes assumes another form which I have called the *double bag,* and is indicative of a twin pregnancy.

I first met with it whilst Interne at the Maternity Hospital in 1839, and was much puzzled by it, inasmuch as I had never met with any account of it and became aware of its significance only after the birth of the twins.

Some years after I met with the same thing at the lying-in hospital of the

Faculty, and remembering my former observation at the Maternity, did not hesitate to assert that there were two children, — which, in fact, were soon born. These are, however, the only cases which I have met with, nor ought their rarity to be a matter of surprise when we consider all the conditions required in order that two ovums, which are liable to assume such various positions in the cavity of the uterus, should be equally forced upon the mouth of the womb by the contractions. Still, it is well to record the fact in order that it may be made available upon occasion.]

FIG. 74.



The form of the bag of waters when the os uteri is fully dilated.

The formation of the sac is easily understood. The uterine cavity is gradually diminished, and the amniotic liquid, pressed on all sides, naturally flows towards the point that offers the least resistance, and such point is evidently the opening in the neck where no walls are found. The reason why so much difficulty existed in comprehending how the membranes could project into the vagina under the influence of this pressure of the liquid, was because the amniotic cavity was supposed to be distended to the utmost by the waters, and consequently that there must either exist a very great extensibility of the membranes, or else a transudation of the fluid through the walls of the ovum; but both hypotheses are false. For it is only necessary to press upon the abdomen of a pregnant woman to become satisfied that in most females a very slight pressure will be sufficient to flatten the ovum, whether in its vertical, transverse, or antero-posterior diameters. This is what takes place in labor, excepting that the ovum can only elongate below, on account of the uterine pressure upon all other parts, and thus produces the amniotic tumor.

When the dilatation is completed and the contraction energetic, the inferior part of the membranes, being no longer supported, soon yields to the impulse, and becomes ruptured, thereby permitting a variable quantity of liquid to escape. Where the pouch is voluminous, and gives way just at the moment of a strong pain, the rupture takes place with such a loud noise, that women in their first labor are often much alarmed, and then also the waters gush out in large quantity. But where the pouch is flat, and only a small quantity of fluid is interposed between the head and the membranes, the latter are lacerated without any noise, and but a little liquid oozes out after their rupture; because, the head by engaging at once in the os uteri obliterates it completely and blocks up the waters.

[When the membranes are ruptured, the following peculiarities may be observed in the discharge of the amniotic fluid. At the beginning of each contraction, it is forced toward the lower segment of the uterus and a small quantity is discharged from the vulva. At the height of the contraction the flow is arrested, because the direct application of the head against the orifice stops it completely. Finally, when the contraction subsides, the head will close the orifice imperfectly and allow a fresh quantity to escape externally.]

In the vast majority of cases, the membranes are lacerated on that portion of the bag corresponding to the uterine orifice. But sometimes the rupture occurs much higher up; and this fact, which is almost inexplicable in the present state of our knowledge, should nevertheless be known, because it accounts for the circumstance of the inferior segment of the ovum being then found intact after the discharge of a certain quantity of water, and of our having to puncture the membranes subsequently in this part. Sometimes they are ruptured in the beginning of the labor, which is thereby usually rendered longer and more difficult for the mother, as also more dangerous for the child, especially when a considerable quantity of water escapes at the same time. Besides these varieties, I have several times noticed a remarkable peculiarity that seems to have escaped the attention of practitioners generally; I allude to the occurrence of a rupture before any contraction of the uterus whatever. This constitutes in a few females the first phenomenon of the labor; but the pains do not come on for some time afterwards, occasionally not for several days. Now, this premature laceration has seemed to me to be coincident with a presentation of the vertex that is deeply engaged in the excavation; for although the patient felt no previous pain, and even in certain cases was sleeping profoundly when the waters escaped, it is highly probable that the uterus had already been contracting for some time, and the occurrence may be referred to those non-painful contractions hitherto described; unless, perhaps, it may possibly depend on an excessive distention of the amniotic pouch.

Sometimes the membranes are very hard, thick, and resistant, the rupture only taking place at an advanced stage of the labor, when the head clears the vulva, for instance; or it may occur in a circular manner, and the head escape covered by a kind of hood. The child is then said to be born with a *caul*, and the vulgar, from that circumstance, prophesy a *happy future*.

The infant may also be born hooded, when a rupture of the membranes first occurs at an elevated point, one not corresponding at all with the uterine neck; and should the head then push before it a portion of the amniotic pouch, serious accidents might result in consequence: for instance, this late rupture might delay the labor, or the tension experienced by the membranes, extending to the placenta, may cause its premature detachment, especially when it is inserted on the sides of the organ, and thus produce a uterine hemorrhage.

In ordinary cases, the rupture takes place at the commencement of the second stage.

The subjoined is a statistical summary made by Churchill, at the Western Lying-in Hospital, during the years 1841 and 1842, which will enable the reader to judge of the varieties that may be met with.

The period elapsing between the commencement of the labor and the rupture of the membranes has been noted in 984 cases. Thus:

In 167	females,	this time was	2	hours.
" 335	"	"	from 2 to 6	"
" 165	"	"	" 6 " 10	"
" 113	"	"	" 10 " 14	"
" 71	"	"	" 14 " 18	"
" 33	"	"	" 18 " 22	"
" 46	"	"	" 22 " 26	"

In	23	females	this time was from	26 " 30	hours.
"	8	"	"	" 30 " 38	"
"	9	"	"	" 38 " 40	"
"	4	"	"	about 50	"
"	2	"	"	" 60	"
"	4	"	"	" 70	"
"	3	"	"	" 80	"
"	1	female	"	" 105	"
	984				

The same observer noted the time from the rupture of the membranes until the child's birth in 812 cases.

In	396	women,	this time was	1	hour.
"	142	"	"	2	hours.
"	120	"	"	4	"
"	50	"	"	6	"
"	34	"	"	8	"
"	17	"	"	10	"
"	26	"	"	15	"
"	11	"	"	20	"
"	3	"	"	28	"
"	4	"	"	35	"
"	1	woman	"	40	"
"	1	"	"	50	"
"	1	"	"	150	"
	812				

§ 5. OF THE DURATION OF LABOR.

The duration of labor is exceedingly variable, even when no obstacle opposes its natural course. Some women are delivered in an hour or two, whilst others are not for several days; and between these two extremes, there is every intermediate grade.

The published statistics are hardly reliable, for most of them have been collected in hospitals; and it is a fact, that the majority of women, dreading to be taken into the apartment devoted to the patients in labor, conceal their first pains, and give up only when they can restrain themselves no longer. Therefore, when interrogated after delivery, their statements are not found to coincide with their record, and make their labor appear much longer than the latter would indicate. This correction seems to me of importance, for most physicians of limited experience, having learned that the duration of labor is from five to six hours, are apt to become alarmed unnecessarily when they find it continuing even longer than from ten to twelve hours.

In general, it is longer in primiparæ than in others; and this difference is chiefly owing to the resistance of the perineal muscles, which is much greater in the former, though it is also influenced by the dilatation of the neck, which is effected in them very slowly.

The whole length of their labor is usually from ten to twelve hours, but it should be known that, in at least one case in five, it may not terminate under fifteen, eighteen, or even twenty hours, and this without any injury whatever resulting either to the mother or the child. Women who have had children are delivered much sooner, only suffering, in ordinary cases, about six or eight hours. According to Alph. Leroy and Velpeau, the pains are apt to observe periods of six hours: that is, the labor lasts either six, twelve, eighteen, twenty-four, or thirty hours. I think, if their observation be correct, it will be found subject to very numerous exceptions.

But, supposing the labor has really commenced, can we predict the hour of its termination with any degree of certainty? This question, which is nearly always addressed to the accoucheur, is oftentimes a very difficult one to answer, for habit alone can enable us to judge by the dilatation, or the suppleness of the neck; by its tension, its hardness, and resistance; by the frequency and intensity of the pains; by the time it has already existed, and by the greater or less resistance of the vulva and perineum, of the probable length of the labor.

It must also be remembered, in regard to the duration, that the first stage of labor is to the second, as two, or even three, to one; and, further, this difference is still more marked in women who have had children, than in primiparæ; and that the first half of the dilatation of the neck is much slower than the second. But how many exceptions are there to this law! For instance, the dilatation is sometimes regular, and sufficiently rapid, everything seeming to promise an easy and prompt termination; yet all at once the pains become feeble and languishing, and our art is often obliged to interpose in aid of the uterine contractions; while, on the contrary, it not unfrequently happens that the neck is expanded with an excessive degree of slowness, after which, a few moments will suffice to effect the delivery.

The form of the vagina, according to Wigand, should also be taken into consideration, in making a prognosis as to the probable duration of the labor: thus, if this canal is large throughout, the whole time will be short; and, on the other hand, the dilatation of the cervix, and the expulsion of the child will be very slow, should the vaginal cavity be regularly contracted throughout its extent; again, if the vulvo-uterine canal is large and spacious superiorly, but contracted and unyielding near the external orifice, the first part of the labor will be prompt, but the last slow and difficult; and, finally (though more rarely), if its upper extremity is very narrow, the inferior being at the same time largely dilated, we may conclude that the parturition will progress slowly at first, but will then terminate speedily.

It is a very singular fact, that an hereditary influence is sometimes manifested in the process, it being not at all uncommon to find the same peculiarities transmitted through three or four successive generations; the mother, the daughter, and the granddaughters being remarkable either for the slowness or rapidity of their labors.

In general, it is impossible to predict with any degree of certainty the hour of its termination; yet most people seem to imagine that the physician is bound to give the most particular information on this point. He must, however, always be very guarded in his replies, for should the labor overrun the fixed time by some hours, it would give rise to the most anxious solicitude, and it is therefore prudent not to be too precise. When such questions are addressed to me, I am in the habit of saying, that, if the contractions are regular, and no accident occurs, if, in a word, all things go on right, the delivery will take place at the hour I name.

In fact, it is absolutely impossible to foresee all that may happen; because, in certain cases, the dilatation of the os uteri, which, perhaps, only amounted to one inch, after five or six hours of labor, is suddenly completed; and, at other times, this process being very little advanced, the margin of the orifice is lacerated under the influence of a strong pain, and the delivery effected, perhaps, just as the physician has announced that the labor will still last for several hours. In examining a young woman, pregnant for the first time, I found the orifice dilated to the size of a quarter of a dollar, and, supposing that the labor would last for some time, I withdrew, but scarcely had I reached the foot of the staircase, when a messenger came running after me in great haste; I immediately returned, and found the head on the point of clearing the vulva, which was already considerably opened. After the labor was over, I ascertained that the whole left side of the vaginal portion of the neck had been lacerated.

A young primiparous female experienced the first pains at four o'clock in the morning. Throughout the day the contractions were very feeble, with intervals varying from a quarter of an hour to an hour. The dilatation was so slow, that at four o'clock in the afternoon the orifice had barely attained the size of a dime. After five o'clock, the pains were rather stronger and quicker; at nine P. M., the neck was very thin, and presented an opening of three-quarters of an inch in diameter. Being obliged to leave the patient for an hour, I thought I might do so with safety, but immediately after my departure the contractions became powerful, and at a quarter before ten, she gave birth to a very small child, which barely weighed five pounds. The small size of the fœtus accounts for the rapidity of the labor; and yet this lady had enjoyed good health during her pregnancy, besides having reached her full term.

The woman's age has not the unfavorable influence upon the duration of labor, even in primiparæ, which is accorded to it by some authors. "There has always," says Madame Lachapelle, "been an opinion prevalent on this point which I can by no means adopt; it is, that the dilatation of the passages is more difficult in women advanced in years than in others, and there is not an accoucheur who does not dread the first labor in a female of thirty or thirty-five years of age; nor is there a woman in that condition who does not anticipate with terror the hour of her delivery. My experience has, however, so often proved the fallacv of such prejudices that I cannot adopt them.

"No doubt, the labor is often slow and painful in middle-aged women who have had no children, yet the same is the case with the youngest. I dare affirm, indeed, that there is no more difficulty in the one case than in the other, and that if four young primiparous females out of ten have easy labors, four out of ten of the oldest will also be delivered with promptitude and facility."

§ 6. OF THE EFFECT OF LABOR UPON THE MOTHER AND CHILD.

A. *Effect of the Labor upon the Mother.*—Independently of the numerous accidents which are liable to occur, and which will be studied hereafter under the head of *Causes of Dystocia*, the parturient process has a decided effect upon the physical and moral condition of the female, which, unfortunately, almost uniformly escapes attention. This effect may be exhibited in both the first and second stages, and even continue for a few hours or days after delivery.

The commencement of labor is preceded in many females by a state of anxiety and prostration, and often by feelings of fear and disquietude. This usually ceases after the first pains are experienced, all the powers of the organism seeming then to be devoted to the accomplishment of the great function about to be performed. All others are modified or suspended, the appetite is lost, and if the patients have eaten shortly before, they not unfrequently reject all that has been taken by vomiting. If much time be occupied by the process of dilatation, they weep, and become irritable and despairing.

This excitability diminishes as soon as the second stage commences, and the patient begins to feel that her *labor* has really begun. From that time her attention seems concentrated on a single object, and she is indifferent to everything else. During the expulsive pains, her condition approaches that which characterizes inflammation or fever; thus, the circulation is quickened in a degree which seems connected with the force of the contractions; the heat and moisture are sensibly augmented, and the red and even livid features sometimes covered with profuse perspiration; again, in some cases the skin may be dry and hot.

The intensity of the pains occasionally throws the patient into a state of extreme agitation, and so disorders her faculties that she commits acts of violence upon her attendants.

This agitation, which is very moderate when the labor progresses regularly, becomes extreme when the latter is retarded or prolonged inordinately. The beginning of each pain is then marked by an almost convulsive trembling of the extremities. The face is burning, and the entire body bathed in perspiration, the eye is fixed and haggard, and the features changed; the unfortunate sufferer screams, laments, desires to die, and begs to be either killed or relieved of her agony. The well-marked disorder of the intellectual faculties is sometimes carried to complete delirium, during which the patients utter the most extravagant expressions. Two such cases have come under my own observation. The delirium is almost always preceded and accompanied by great loquacity, and the pains are hardly felt. I knew a young lady, after a rather lengthy labor attended with extreme suffering, suddenly to cease complaining, assume a smiling expression, and after a few incoherent phrases, to sing in full voice the grand air of *Lucia di Lammermoor*. I cannot express the terrifying effect produced by this song upon myself and the attendants. (A bleeding, followed by the immediate application of the forceps, had the effect of calming the patient, and there was no recurrence of delirium.) Montgomery also states, that he has known women to be completely delirious for a few moments, just as the head was escaping from the mouth of the womb.

These great disturbances of the economy are not confined to cases of very tedious labor, for the same symptoms have been witnessed in very short ones with powerful and very rapid pains. The cerebral excitement which their violence produces, may be carried even to the point of insanity; so that medico-legal jurists have accounted for infanticides by this momentary disorder of the intellect, which would otherwise have been inexplicable.

The disorder is sometimes confined to the affective faculties. I have seen a mother, says Ed. Rigby, after a very short and painful labor, exhibit an unconquerable aversion to her child, and express herself in reference to it in terms which contrasted strangely with the tender and affectionate remarks which she had uttered but a few moments previously.

These disorders of the intellectual and affective faculties generally last but a short time, and are not significant of great danger; sometimes, however, the shock to the system is so great, that death takes place suddenly, either during the course of the labor, or shortly after delivery. A poor woman, in the Charity Hospital, says Davis, had been in labor for five hours; the membranes ruptured, and a large amount of water escaped; the discharge was immediately followed by a feeling of great weakness; having a desire to go to stool, she sat down upon a chamber, made a few efforts, and fell fainting. She was placed in the horizontal position as soon as possible, but had hardly been replaced in bed before she had ceased to live. The autopsy revealed nothing which would account for the death. Denman also mentions several cases of sudden death during labor, which it was impossible to explain.

In some of these instances, however, the sudden discharge of a large amount of water might, to a certain extent, lead us to attribute the mortal syncope to the same cause which is thought to produce it so often after delivery: namely, the sudden afflux of a great quantity of blood to the abdominal vessels, which had been suddenly relieved from the pressure to which they were subjected during pregnancy.

An undue importance has, I think, been attributed to this too rapid depletion of the organ as explanatory of sudden death after labor. In some instances, it may have all the influence accorded to it, though it is certainly incapable of accounting for all known facts.

The violent efforts made by the woman in the second stage of labor may also occasion a rupture of some part of the respiratory organs. This explains the cases of emphysema of the face, neck, and upper part of the breast, mentioned by several authors (Martin, of Lyons). In a serious case related by M. Depaul, death resulted apparently from double pulmonary emphysema occurring suddenly during the violent expulsive efforts of a long and painful labor.

The fatal effect of the process of parturition upon the nervous system of the mother, after as well as during labor, cannot be mistaken; and I believe with Churchill that it consists in a shock ot greater or less intensity to the cerebro-spinal system. This shock, which is an effect of the extraordinary agitation produced by parturition, is altogether similar to that occasioned by extensive wounds, and which sometimes destroys unfortunate workmen who have had a member crushed by a machine, or to that produced by an extensive burn. The sudden death, which neither the circumstances of the accident, nor the lesions discovered at the autopsy are capable of explaining, is attributed by surgeons to nervous shock.

Not only, says the author just cited, may such a nervous shock take place in certain labors, especially difficult ones, and have a disastrous result, but it exists to a greater or less extent in almost every case. Moderate attention will make this manifest. Thus, after an ordinary labor, the general sensibility is almost always extreme: although the senses are more acute than usual, the eyes have lost their lustre, and are weak and languishing; the least light hurts them, as the slightest sound offends the ear; and if this extreme delicacy be not respected, serious accidents may ensue.

Under ordinary circumstances, patients recover from this slight collapse after a few hours' rest; but when the labor has been protracted, or an operation, such as turning, has been demanded, the symptoms are much more severe. The patient is much weaker, and the expression of features is fixed and dull; she lies motionless in bed, with closed eyes, or opens them from time to time, without, however, fixing them upon any object in particular; she pays no regard either to her child or to herself; the limbs are in a state of complete relaxation; the pulse is sometimes slow, at others frequent and irregular, though always weaker than usual, and the breathing slow and difficult, or quick and panting.

The patient may remain in this condition for a long time, and recovers from it slowly and gradually. If the shock has been too great, she may grow weaker and weaker, until the prostration ends in death. The autopsy, under these circumstances, fails to throw any light upon the cause of death.

This singular state of affairs is not always manifested immediately upon delivery; for sometimes considerable time elapses, during which the patient expresses herself as feeling very well, then suddenly complains of unusual weakness, exclaims that she is about to faint, and yet is unable to account for the cause of her condition. There are no particular abdominal symptoms, no evidence of hemorrhage, and the uterus is well contracted; still the disorder increases, the pulse grows weaker, the face becomes pale and assumes a cadaverous expression, and the patient is so prostrated as to be able to express her feelings only by a groan. Suddenly she experiences a sensation of violent constriction of the chest, and expires before anything can be done for her relief.

Opium, says Churchill, has seemed to me the most effectual remedy in these cases. Five drops of laudanum may be given every half hour, then every hour, and finally at longer intervals. It appears to calm the general disturbance, diminish the cerebral shock, and give to the whole system sufficient time to recover its exhausted forces. Small quanties of wine and brandy may, at the same time, be given at intervals, in doses sufficient to assist in re-establishing the strength, but not in such quantity as to produce a general reaction. The induction of sleep will be assisted by entire quietness of both body and mind, and when so fortunate a result is obtained, the strength is recruited, and the pulse and respiration become calm; if, on the contrary, the prostration continues, the case is one of the most dangerous character, and demands the increased use of external and internal stimulants. Ramsbotham recommends that pressure should also be made upon the abdomen, doubtless with the object of preventing the afflux of fluids towards the abdominal vessels.

If the agitation, spasm, and delirium, of which we have spoken, appear during labor, blood should be taken immediately from the arm, provided the general condition of the patient admit of it, and the delivery be accomplished as soon as possible.

The same course is also indicated by the sudden occurrence of a marked disorder of one of the organs of the special senses,—amaurosis, for example.

B. *The effect which labor may have upon the fœtus* depends upon a multitude of circumstances, most of which will be studied hereafter. Thus, having described the mechanism of labor in each presentation, we shall treat of the effect which each is liable to have upon the health and life of the child. The various causes of dystocia are quite as unfavorable to the latter as to its mother.

We have but these observations to make in this place; namely, that all things else being equal, the mortality of male infants is much greater than that of females, which is due, as we have said before, to the greater size of the former, and the proportionally longer duration of the labor in consequence; the extreme slowness of this process, which so often proves fatal to the fœtus, has this unfortunate effect only when it affects the second or expulsive stage. Until the membranes are ruptured, and even until the dilatation is completed, the labor may be prolonged indefinitely without injury to the fœtus, provided a certain amount of fluid remains in the uterus.

It were hardly necessary to observe that any cause of dystocia is liable to affect the mother's health injuriously, and she is more liable to consecutive inflammations and other unfavorable complications of labor when delivered of a boy than of a girl.

CHAPTER III.

OF THE MECHANICAL PHENOMENA OF LABOR.

ARTICLE I.

OF THE PRESENTATIONS AND POSITIONS.

WHEN speaking of the child's attitude in the uterine cavity, we stated that it was generally so situated that the cephalic extremity formed the most dependent part. But it may also happen, under the influence of causes hereafter to be studied, that some other point of the great axis shall correspond to the uterine neck: that is to say, the upper or cephalic extremity, the inferior or the pelvic extremity, or even some part of the middle portion or trunk, may first present itself at the superior strait. Now, it is very evident that such different circumstances of presentation must necessarily influence the mechanism of the labor, as also the facility and the promptness of the delivery, and it is therefore highly important to understand well all those diverse situations before commencing the study of the mechanism proper. This study comprises the presentations and positions, as they are called; and in using these terms we wish to designate by the word *presentation* the part that first offers at the superior strait; and by that of *position*, the relations of this presenting part with the different points of the same strait.

The older accoucheurs only endeavored to recognize the presenting part, without investigating its relations with the various points of the circumference of the strait; but since the days of Solayres, and more especially since those of his pupil Baudelocque, everybody has had a classification of his own; and the number of presentations and positions, considered as so many separate and distinct ones, varied with each author who wrote on the obstetrical art.

We give, in the following tables, the classification of Baudelocque, and the principal ones of those who have succeeded him.

GENERAL TABLE OF THE CLASSIFICATIONS.

NAMES OF AUTHORS.	PRESENTATION.	RELATIONS OF THE FŒTAL PARTS WITH VARIOUS POINTS OF THE PELVIS.	NAMES OF THE POSITIONS.
BAUDELOCQUE,	VERTEX OR SUMMIT,	Occiput at the left acetabulum,	1st. Left occipito-cotyloid.
		Occiput at the right acetabulum,	2d. Right " "
		Occiput at the symphysis pubis,	3d. Occipito-pubic.
		Occiput at the right sacro-iliac symphysis,	4th. Right occipito-sacro-iliac.
		Occiput at the left sacro-iliac symphysis,	5th. Left occipito-sacro-iliac.
		Occiput at the sacro-vertebral angle,	6th. Occipito-sacral.
	FACE,	Chin at the symphysis pubis,	1st. Mento-pubic.
		Chin at the sacro-vertebral angle,	2d. Mento-sacral.
		Chin directly to the right,	3d. Right mento-iliac.
		Chin directly to the left,	4th. Left mento-iliac.
	FEET,	Heels at the left acetabulum,	1st. Left calcaneo-cotyloid.
		Heels at the right acetabulum,	2d. Right calcaneo-cotyloid.
		Heels at the symphysis pubis,	3d. Calcaneo-pubic.
		Heels at the sacro-vertebral angle,	4th. Calcaneo-sacral.
	KNEES,	Front of the tibias at the left acetabulum,	1st. Left tibio-cotyloid.
		" " at the right acetabulum,	2d. Right tibio-cotyloid.
		" " at the symphysis pubis,	3d. Tibio-pubic.
		" " at the sacro-vertebral angle,	4th. Tibio-sacral.
	BREECH,	The sacrum at the left cotyloid cavity,	1st. Left sacro-cotyloid.
		The sacrum at the right cotyloid cavity,	2d. Right sacro-cotyloid.
		The sacrum at the symphysis pubis,	3d. Sacro-pubic.
		The sacrum at the sacro-vertebral angle,	4th. Sacro, or lumbo-sacral.

NAMES OF AUTHORS.	PRESENTATION.	RELATIONS OF THE FŒTAL PARTS WITH VARIOUS POINTS OF THE PELVIS.		NAMES OF THE POSITIONS.
BAUDELOCQUE,	TRUNK,	Occiput, Neck, Back, Loins, Face, Front of neck, Breast, Abdomen, Front of pelvis, " of thighs, Side of the head, " of neck, Shoulder, Side of thorax, Flank, Hip,	Four positions for each of these presentations, viz.:	
			Head above the pubis,	1st. Cephalo-pubic.
			Head above the sacro-vertebral angle,	2d. Cephalo-sacral.
			Head to the left,	3d. Left cephalo-iliac.
			Head to the right,	4th. Right cephalo-iliac.
GARDIEN,	VERTEX,	Six positions, the same as Baudelocque,		Same denomination as Baudelocque.
	FACE,	Four positions, the same as Baudelocque,		" " "
	FEET, KNEES, BREECH,	Four positions, the same as Baudelocque,		" " "
	TRUNK,	Four positions for each of these, viz.:		
		Right side,	Head to the left,	1st. Left cephalo-iliac.
		Left side,	Head to the right,	2d. Right cephalo-iliac.
		Anterior plane,	Head in front,	3d. Cephalo-pubic.
		Posterior plane,	Head behind,	4th. Cephalo-sacral.
CAPURON,	VERTEX,	Occiput at the left acetabulum,		1st. Left occipito-cotyloid.
		Occiput at the right acetabulum,		2d. Right occipito-cotyloid.
		Occiput at the right sacro-iliac symphysis,		3d. Right occipito-sacro-iliac.
		Occiput at the left sacro-iliac symphysis,		4th. Left occipito-sacro-iliac.
	FACE,	Chin at the left acetabulum,		1st. Left mento-cotyloid.
		Chin at the right acetabulum,		2d. Right mento-cotyloid.
		Chin at the right sacro-iliac symphysis,		3d. Right mento-sacro-iliac.
		Chin at the left sacro-iliac symphysis,		4th. Left mento-sacro-iliac.

CAPURON,	Feet, Knees, Breech,	Four positions for each of these three presentations, according as the heels, the anterior tibial surfaces, or the posterior face of the sacrum correspond to the—		
		Left acetabulum,		First position.
		Right acetabulum,		Second "
		Right sacro-iliac symphysis,		Third "
		Left sacro-iliac symphysis,		Fourth "
	Trunk,	Right side,	In each of these four the head may be found above the—	
		Left side,	Left acetabulum,	1st. Left cephalo-cotyloid.
		Anterior plane,	Right acetabulum,	2d. Right cephalo-cotyloid.
		Posterior plane,	Right sacro-iliac symphysis,	3d. Right cephalo-sacro-iliac.
			Left sacro-iliac symphysis,	4th. Left cephalo-sacro-iliac.
LACHAPELLE,	Vertex,	Occiput at the left acetabulum,		1st. Left occipito-cotyloid.
		Occiput at the right acetabulum,		2d. Right occipito-cotyloid.
		Occiput at the right sacro-iliac symphysis,		3d. Right occipito-sacro-iliac.
		Occiput at the left sacro-iliac symphysis,		4th. Left occipito-sacro-iliac.
		Occiput directly to the left,		5th. Left occipito-transverse.
		Occiput directly to the right,		6th. Right occipito-transverse.
	Face,	Chin directly to the right,		1st. Right mento-iliac.
		Chin directly to the left,		2d. Left mento-iliac.
	Pelvic Extremity,	Loins to the left,		1st. Left lumbo-iliac.
		Loins to the right,		2d. Right lumbo-iliac.
		Loins in front,		3d. Lumbo-pubic.
		Loins behind,		4th. Lumbo-sacral.
	Trunk,	Right side,	Head left,	1st. Left cephalo-iliac.
			Head right,	2d. Right cephalo-iliac.
		Left side,	Head left,	1st. Left cephalo-iliac.
			Head right,	2d. Right cephalo-iliac.
VELPEAU,	Vertex,	Like Baudelocque,		Same as Baudelocque.
	Face,	Like Lachapelle,		Same as Lachapelle.
	Feet, Knees, Breech,	As many positions for each of these three presentations as for the vertex.		The same corresponding denominations for each of the six positions.
	Trunk,	Right side, Left side,	Two positions for each of these, viz.:	
		Posterior plane,	Head to the left,	1st. Left cephalo-iliac.
		Anterior plane,	Head to the right,	2d. Right cephalo-iliac.

CLASSIFICATION OF PROFESSOR MOREAU.

TWO CLASSES.
- NATURAL LABORS.
- ARTIFICIAL LABORS.

FIRST CLASS.—NATURAL LABORS.

- **FIRST ORDER.** Presentation of the cephalic extremity.
  - 1ST GENUS. Vertex presentation.
    - 1st position.—Left occipito-ilium.
      - anterior,
      - transverse,
      - posterior.
    - 2d position.—Right occipito-ilium.
      - anterior,
      - transverse,
      - posterior.
    - 3d position.—Occipito-pubic.
    - 4th position.—Occipito-sacral.
  - 2D GENUS. Face presentation.
    - 1st position.—Right mento-ilium.
      - anterior,
      - transverse,
      - posterior.
    - 2d position.—Left mento-ilium.
      - anterior,
      - transverse,
      - posterior.
  - 3D GENUS. Presentation of the sides of the head. 2 subdivisions.
    - 1st position.—Lobulo-pubic.
    - 2d position.—Left lobulo-ilium.
    - 3d position.—Right lobulo-ilium.
    - Right side.
    - Left side.
      - 1st position.—Lobulo-pubic.
      - 2d position.—Left lobulo-ilium.
      - 3d position.—Right lobulo-ilium.
- **SECOND ORDER.** Presentation of the pelvic extremity.
  - 1ST GENUS. Breech presentation.
    - 1st position.—Left sacro-ilium.
      - anterior,
      - transverse,
      - posterior.
    - 2d position.—Right sacro-ilium.
      - anterior,
      - transverse,
      - posterior.
    - 3d position.—Sacro-pubic.
    - 4th position.—Sacro-sacral.
  - 2D GENUS. Foot presentation.
    - 1st position.—Left calcaneo-ilium.
    - 2d position.—Right calcaneo-ilium.
    - 3d position.—Calcaneo-pubic.
    - 4th position.—Calcaneo-sacral.
  - 3D GENUS. Presentation of the knees.
    - 1st position.—Left tibio-ilium.
    - 2d position.—Right tibio-ilium.
    - 3d position.—Tibio-pubic.
    - 4th position.—Tibio-sacral.
- **THIRD ORDER.**
  - Accidental natural labor.
    - Single genus.—Presentation of the trunk. (See below.)

SECOND CLASS.—ARTIFICIAL LABORS.

- **FIRST ORDER.** Accidental artificial labor.
  - 1ST GENUS. Accidents on the mother's part.
  - 2D GENUS. Accidents on the part of the fœtus.
- **SECOND ORDER.** Essentially artificial labor.
  - SINGLE GENUS. Presentation of the trunk. 2 subdivisions.
    - 1st. Right side. . .
      - 1st position.—Left cephalo-ilium.
      - 2d position.—Right cephalo-ilium.
    - 2d. Left side. . .
      - 1st position.—Left cephalo-ilium.
      - 2d position.—Right cephalo-ilium.
- **THIRD ORDER.** Labors which are the result of malformation.
  - 1ST GENUS. On the part of the child.
  - 2D GENUS. On the part of the mother.

APPENDIX, OR THIRD CLASS.—ANOMALIES.

Anomalies either in the seat, course, or products of gestation, or lesions of the womb.

The reader will see, by the foregoing table, that Baudelocque primarily divides the fœtus into two extremities: the one represented by the apex of the head, the other by the feet, knees, or breech; and further, that the remainder of the child's surface is divided off into four regions, which are again subdivided into several others. After having determined the fœtal regions, the presence of which, at the superior strait, constituted a presentation, it was equally necessary to understand the positions. For that purpose certain points of departure were selected, both on the pelvis and on the presenting part of the child. Of course, these points varied according to the presentation: thus, in a vertex one, Baudelocque took the occiput and forehead as the points on the fœtal head; he then divided the pelvis into an anterior and a posterior half; on the first of which the right and the left cotyloid cavities and the symphysis pubis, and on the second the right and left sacro-iliac symphyses, and the sacro-vertebral angle, were selected as the points of departure; he next established six positions of the vertex, in each of which the occiput corresponded to one of those points on the pelvis just indicated.

In the presentations of the breech, knees, and feet, he retained the same three points on the anterior half of the pelvis, but on the posterior half he only adopted one: the sacro-vertebral angle. On the fœtus, the heels were the points of correspondence in foot presentations, the sacrum for the breech, and the front surface of the legs for those of the knee. Consequently, but four positions were admitted for either the breech, feet, or knees.

Lastly, for the presentations of the numerous regions indicated by the table on the anterior, posterior, and lateral planes of the fœtus, he selected on the mother's pelvis the two extremities of the antero-posterior diameter (the symphysis pubis and the sacro-vertebral angle), and the two ends of the transverse diameter, as the points of departure, so that he pointed out four possible relations, that is to say, four positions for each one of these presentations. Thus, Baudelocque admitted altogether one hundred and two distinct positions. But it was soon ascertained that so great a number was wholly useless in practice: and besides, it had the serious disadvantage of disgusting pupils with the study of midwifery. The classification of Baudelocque was therefore modified to some extent, and we have successively traced, in our table, the principal of those modifications; still, even after adopting the latter, the obstetrical art was yet greatly confused, and it remained for M. Nægèle to simplify this branch of medical science, much more than it had ever been done before his day. To him, therefore, we must attribute this honor, as also to Dubois, and Stoltz, of Strasbourg, who first endeavored to disseminate throughout France the views of the Heidelberg professor! It must be acknowledged, however, that the labors of Madame Lachapelle, and the teachings of Ant. Dubois, have not been altogether foreign to this improvement.

We should also observe that the classification of M. Moreau is far more simple than all those of Baudelocque and his followers; indeed, this professor has adopted (as seen by the table) most of the ideas upon which the arrangement of Nægèle is founded, and we only regret that he has considered the presentations of the sides of the head and certain of the positions as distinct, which we hope to demonstrate hereafter do not deserve to be so regarded.

In fact, there is no region of the child which may not present at the superior strait during the labor, and therefore, if we are to consider all the points of its surface that may be accessible to the finger as so many distinct presentations, their number would be very considerable; but if, on the contrary, the expression is only applied to the presence of a region large enough to occupy the whole superior strait, more especially to one requiring a notable difference either in the mechanism of its spontaneous expulsion, or in the manœuvres to be resorted to, this number would then be much more limited.

Upon such opinions, advocated long since by Madame Lachapelle and Ant. Dubois, M. Nægèle has founded the following classification, which is now admitted and taught by Dubois and Stoltz in France, namely, three principal regions are distinguished in the fœtus: 1. The head, or cephalic extremity; 2. The pelvis, or pelvic extremity; and 3. The trunk; either of which parts may offer first at the superior strait.

When the cephalic extremity presents, it is ordinarily flexed on the chest, and the vertex then advances first; but it may also be extended or thrown backwards on the posterior plane of the fœtus, in which case the face engages first. We have therefore to distinguish between a vertex presentation and one of the face, for the mechanism of labor is very different in the two. When the pelvic extremity presents, the legs are usually flexed on the thighs, and the latter on the abdomen; but it may happen, from a variety of causes that we shall hereafter designate, that these divers parts, which are usually folded up in this manner, are separated from each other: thus, they sometimes engage altogether in the excavation; at others, either during the course of the labor itself, or some time before, the inferior members stretch out and lay along the front of the body, and the nates then descend alone. Again, the legs may be swept down either by the gush of the waters, or by some other cause, and engage first; hence, in this latter instance, if the deflexion of the lower members is complete, the feet are the first to clear the vulva; but if, on the contrary, the thighs be extended, and the legs remain flexed on them, the knees will be the first to show themselves at the external orifice.

Now it must be evident, on the least reflection, that these latter circumstances can effect no modification in the mechanism of the labor itself, and accoucheurs are certainly in error in considering them as so many distinct presentations; consequently, we shall describe them under the single title of the presentation of the pelvic extremity; merely remarking that, when this extremity presents, all its constituent elements may happen to engage together at the same time, or they may be separated, and then the breech, or the knees, or feet, will offer first at the vulva.

But before proceeding any further, we will follow the example of M. Dubois (from whom this article is borrowed almost verbatim), by laying down precisely the limits of the fœtal regions embraced in the double expression of the cephalic and the pelvic extremity: thus, when the head or the pelvis presents at the superior strait, it usually does so nearly "plumb:"

that is to say, the long diameter of the fœtus is almost parallel to the axis of this strait; so that the sagittal suture in the vertex presentations, the facial median line in those of the face, and the fissure between the nates in those of the pelvic extremity, occupy very nearly the centre of the abdominal strait.

But very numerous exceptions to this rule occur, because the mobility of the fœtus in the uterine cavity, and the frequency of the uterine obliquities, may cause the child's long diameter to be inclined forwards, backwards, or towards the sides. Hence, it is evident that the presenting part, participating in this inclination, will not be so regularly placed as usual; thus, if it were a vertex presentation, and the inclination were anterior, the summit would no doubt descend, though it would be accompanied by the forehead in consequence of this defective position; or, if the inclination were on the posterior plane, instead of the forehead, we should have the occiput or occasionally even the neck. Again, if it is lateral, that is, if the fœtus is bent towards one side, the vertex and one side of the head may be recognized at the same time; and the sagittal suture, instead of corresponding to the axis of the superior strait, will then be found either behind or in front, according to the direction of the inclination; but such inclinations do not deprive the vertex presentation of its character, they only convert it into a defective or irregular presentation.

The observations just made in regard to vertex presentations equally apply to those of the face and breech, and we may therefore have regular and irregular ones of these parts just in the same way. To resume, we shall include in the class of vertex presentations, all those designated by Baudelocque under the names of presentations of the occiput, nape, and lateral parts of the head; in face presentations, those of the forehead, chin, cheeks, front and sides of the neck; and in the breech, those of the sacrum, genital parts, front of the thighs, &c.; whence all the surface comprised between the sinciput and the shoulders belongs to the cephalic presentations, and that between the summit of the nates and the haunches is referred to the pelvic ones.

If we now take off all the fœtal parts included in the cephalic and pelvic extremities, there will only remain the trunk proper: that is, the portion extending from the shoulders to the hips, and this part may also present the first. Now with regard to this, Madame Lachapelle has long since remarked that, when the trunk offers at the superior strait, it always does so by one of its sides: that is to say, the anterior or the posterior median line of the body never corresponds to the axis of the superior strait. Therefore, she divided the trunk into two lateral halves, either of which may come down first; hence there are two trunk presentations, one of the right lateral plane, the other of the left lateral plane; the whole anterior and posterior right moieties being included in the first, and the same parts on the left being embraced in the second; and as the shoulder, which is then the most prominent part, is nearly always found at the centre of the superior strait, when the lateral planes offer first, that skilful midwife designated them as *presentations of the shoulder*. M. Dubois, however, still retains the name of the *presentations of the lateral regions;* and these, like the others, may either be regular or irregular. They are regular when the lateral line is directly at the centre of the abdominal strait, but irregular where the anterior or the posterior region of the trunk occupies this strait in a great measure, owing to the child being more or less inclined forward or backward; and it is to such irregularities that we must refer all those presentations of the back, loins, front of the chest and abdomen, described by the older authors.

On the whole then we admit five presentations, viz., one of the vertex, one of the face, one for the pelvic extremity, one for the right lateral plane, and one for the left lateral plane. Besides the presentations, Baudelocque, and all those who followed him, described a great number of *positions;* in each of which, according to their account, the mechanism of the labor was different. But M. Nægèle, in consequence of a better conducted study of this mechanism, has succeeded in changing entirely this branch of the science, and has further proposed a reform in the positions, at least as important as what he has already made in the classification of the presentations. Thus, he simply divides the pelvis into two lateral halves, the right and the left, and these form the only points of departure at the superior strait; on the fœtus, the points admitted by Baudelocque are retained. For instance, in a vertex presentation, the occiput may offer at any one point whatever of the left lateral half of the superior strait, thereby constituting the first position of the vertex; or it may correspond in a similar way with the right lateral half, thus producing the second position; further, as the mechanism is just the same, whether the occiput be at first at the front, in the middle, or behind, we shall only consider these circumstances as so many varieties of the same position; which shades or varieties, in the great majority of cases, do not change the mechanism of the natural labor in any wise, and therefore do not deserve to be received as important elements in a classification, but of which, however, more account should be taken than appears to have been done by M. Nægèle, for they may be usefully recalled in explanation of certain anomalies, as also for successful intervention in some cases of difficult labor.

What has just been stated concerning the vertex equally applies to the positions of the face and breech; since in the former the chin may be directed towards some point, either on the right or the left lateral half of the pelvis; and in the latter the sacrum may have a similar relation with some point of its right or left half; therefore we adopt a first, or the *right mento-iliac*, and a second, or the *left mento-iliac* position for the face; and likewise for the breech we have a first, or the *left sacro-lateral*, and a second, or the *right sacro-lateral* position. Lastly, the two presentations of the trunk have each two positions: for example, the right side of the fœtus presenting, the head may happen to be placed either above some point on the left lateral moiety, or over a similar part on the right one. Hence, there are two positions: first, the *left cephalo-iliac*, and second, the *right cephalo-iliac;* or, if the child's left side presents in the same way, the head may be either to the left or the right, thus giving rise to two new positions, the *left* and the *right cephalo-iliac* position.

[Perhaps it would be better to adopt M. Jacquemier's expression and say, that when a shoulder presents, the acromion is directed sometimes toward the left and sometimes toward the right side of the pelvis. Hence we have two positions, left acromio-iliac and right acromio-iliac. The same idea is, therefore, expressed, whether we say that the right shoulder presents in a left cephalo-iliac or in a left acromio-iliac position, but the assumption of the acromion as the point of reference makes the nomenclature clearer and more uniform.]

There is scarcely a necessity for adding that the *anterior*, *transverse*, and *posterior* varieties, admitted for vertex positions, are also retained for the two fundamental ones of the face, the breech, and the right and left sides.

SUMMARY.

1. Vertex presentation, . .	Left occipito-iliac, . .	3 varieties,	anterior, transverse, posterior.
	Right occipito-iliac, . .	3 varieties,	anterior, transverse, posterior.
2. Presentation of the face,	Right mento-iliac, . .	3 varieties,	anterior, transverse, posterior.
	Left mento-iliac, . .	3 varieties,	anterior, transverse, posterior.
3. Presentation of the breech,	Left sacro-iliac, . .	3 varieties,	anterior, transverse, posterior.
	Right sacro-iliac, . .	3 varieties,	anterior, transverse, posterior.
4. Presentation of the right lateral plane, ...	Left cephalo or acromio-iliac, . .		anterior, transverse, posterior.
	Right cephalo or acromio-iliac, . .		
5. Presentation of the left lateral plane, ...	Left cephalo or acromio-iliac, . .		
	Right cephalo or acromio-iliac, . .		

We would observe, however, that in shoulder presentations the varieties of position are far less important than in the other presentations, and that it matters very little whether the acromion and the head be more or less in front or behind.

But all the presentations and positions just indicated have not the same frequency, nor are they all equally favorable to the spontaneous expulsion of the child. There are some even, such as the positions of the trunk, in which this is most generally impossible, but there is no one, however, in which it absolutely cannot take place; therefore, we shall have to examine the mechanism of natural labor in each of these presentations successively, reserving to ourselves the privilege of reverting in the fourth part of this work to those which usually offer an insurmountable difficulty; and as the vertex presentations are the most frequent and favorable of all, we shall commence with a description of them.

ARTICLE II.

OF THE VERTEX PRESENTATION.

This presentation is far more frequent than all the others put together: thus, in 20,517 births reported by Madame Boivin, 19,810 children were born by the vertex; and in 2020 cases reported by M. Dubois, there were 1913 of this variety. Again, when the vertex presents, the occiput is much oftener directed towards the left than the right side: for instance, in the 1913 cases just cited, M. Dubois noticed 1367 left occipito-iliac, and only 546 right occipito-iliac positions. Nor are the three varieties pointed out for each position equally frequent: thus, in the 1367 cases where the occiput was directed to the left side, it was inclined forward, that is, towards the left cotyloid cavity, 1355 times, and only 12 times backwards, in the direction of the left sacro-iliac symphysis, or nearly so. But in the 546 instances of right occipito-lateral positions an opposite result was observed; for the occiput was only found 55 times at the right acetabulum, but 491 times at the right sacro-iliac symphysis; so that, contrary to the generally received opinion, the posterior right occipito-iliac position is much more frequent than the anterior one. We have given these results as ascertained by M. Dubois himself, because they are entirely consonant with our own observations, and with those of M. Stoltz, of Strasbourg.

In one hundred cases of vertex presentations, it has been found on an average, says M. Nægèle, that in seventy the occiput is directed in front and to the left, and behind and to the right in thirty; he considers the other varieties as being very rare and altogether exceptional.

In these results, no question seems to be made of the varieties we have designated as the transverse ones, and it is highly probable that they have been approximately added to one of the four preceding groups, for these positions are not very unusual; indeed, I have often met with them myself at the Clinique.

"These positions," says Madame Lachapelle, "are more frequent than those where the occiput corresponds to the left sacro-iliac symphysis;" and, I will add, than those where it is at the right acetabulum; also, that the left transverse occipito-iliac position is more common than the opposite one.

§ 1. Causes.

As we have already spoken of the cause of the vertex presentations, when treating of the child's attitude in the uterine cavity, we shall not now go over the same ground, but will only remark, that most accoucheurs attribute the frequency of the dependent position of the head to its own specific weight; whilst M. Dubois, after having endeavored to refute the general opinion, has considered this position as the consequence of an instinctive determination of the fœtus itself. (See art. *Fœtus.*) However, it is not at all difficult to explain why the left anterior, and the right posterior occipito-iliac varieties are the most frequent of any, since it is evidently owing to the presence of the rectum on the left side. The habitual distention of this bowel by fecal matters obliges the forehead or occiput to turn towards the front whenever either of these parts is directed backwards and to the left.

It is far more difficult to say why the occiput is so much more frequently found in front than behind, although this very probably depends on the same causes as those which determine the vertex presentation.

Thus, the posterior half of the head weighs far more than the anterior, and the same is true of the trunk; further, when the woman is standing, sitting, or on her knees, or even lying on the side, the anterior wall of the abdomen is the most dependent portion, towards which the child's heaviest parts, that is to say, its posterior plane, must necessarily tend.

§ 2. DIAGNOSIS.

[The presentation of the vertex and its positions may be determined by three different kinds of examination, viz., palpation of the abdomen, auscultation, and the vaginal touch.

Palpation of the Abdomen.—If the hands be placed upon the abdomen and the walls of the uterus depressed, parts of the fœtus may be felt and with a little practice distinguished quite readily.

To obtain the best results from this method, the woman should lie upon her back with the walls of the abdomen as much relaxed as possible, and by gentle pressure be accustomed to the contact of the hands. At the outset it is not uncommon for the examination to be interrupted by a contraction of the womb, which, of course, should be allowed to subside. After some trials, however, the abdominal muscles and the walls of the uterus yield to the pressure, so that the hand which explores the hypogastric region is enabled to distinguish with some precision a voluminous, hard and rounded mass which recalls exactly the size and form of the head of a child. Above it may often also be recognized the entire dorsal region of the fœtus, so that it only becomes a question between a presentation of the vertex and one of the face.

A circumstance which may embarrass physicians, who have but little experience in this kind of research, arises from the fact, that near the end of pregnancy, and especially in primiparous cases, it often happens that the entire head has descended into the cavity of the pelvis and necessarily escapes detection by the hand which confines itself to a superficial examination of the hypogastric region. In this case, if the ends of the fingers be placed above the body of the pubis and pressed downward as though to push the walls of the abdomen into the lesser pelvis, the head of the child will soon be felt filling the entire cavity. I have in hundreds of instances succeeded in this way in diagnosing the vertex presentation, and that without causing either pain or accident.

The presentation being determined, if the accoucheur can feel to which side the back of the child is turned, the palpation has enabled him to diagnose both presentation and position.

In the occipito-posterior positions, the greatest width of the womb is still at the upper part, as stated in the account of the normal condition; but the fundus is not so evenly rounded unless the quantity of fluid be very great: most commonly, says M. Stoltz, an arched projection may be detected at the fundus, and beneath it a sensible depression. The anterior plane of the fœtus being directed forward, the inequalities formed by its extremities, which are discovered with difficulty in occipito-anterior positions, are detected more readily.

A certain degree of importance ought, therefore, to be accorded to this kind of exploration, though we should be careful not to over-estimate its value. In the most simple cases we are sometimes liable to be deceived, and a mistake becomes easy when the walls of the abdomen are thick or the quantity of waters great. Finally, it should be understood that in some women the uterus is so readily excited to contraction, that it becomes impossible to depress its walls sufficiently to arrive at any result. Still another consideration which lessens the value of palpation is, that, though it may be easy before labor comes on, it becomes difficult or even impossible at that time; all which is readily explained by the severe pains which it provokes and the facility with which it excites the contraction of the uterus.

Auscultation.—The diagnosis of the presentations and positions of the vertex may also be determined by auscultation. As Prof. Depaul has treated this subject thoroughly in his *Traité d'Auscultation Obstétricale*, I will merely state here, that in the presentation of the cephalic extremity, the maximum intensity of the pulsations of the heart are heard above a horizontal line passing through the umbilicus. To this law there are very few exceptions in a normal condition of the pelvis, and whatever relates to deformities need not detain us here.

Auscultation is not less important in order to determine the position. As in the fœtus the lungs are flattened against the vertebral column, the sound of the heart is transmitted to the ear through the dorsal region whose curvature is applied against the walls of the uterus; therefore, as the greatest intensity of the sounds of the heart is perceived over the spinal column, and as both it and the posterior fontanelle are directed toward the same side, we learn where the occiput is situated. In the left anterior occipito-iliac position the heart beats in front and to the left, whilst in the right posterior occipito-iliac position it is heard behind and to the right. The same reasoning indicates certainly the point at which the head ought to be heard for each particular position. To avoid being deceived by the data which auscultation supplies, we ought always to determine and fix precisely, not the point where the heart is heard merely, but the point where the sound is loudest. Without this precaution auscultation would be as deceptive as useful in the endeavor to determine the position.]

Vaginal Touch.—Before labor, and even during the last few months of gestation, the vertex can often be recognized as presenting; while in every other presentation the part that offers first, from being irregular, voluminous, and badly adapted to the form of the inferior uterine segment, and of the superior strait, is always so high up, and separated from the uterine wall by so large a quantity of waters, as to be scarcely accessible to the finger.

The vertex, on the contrary, presenting a rounded spheroidal surface, reposes, almost without the intervention of any liquid, on the uterine walls, nay, even presses them before it, and engages in the excavation, descending in some cases as low down as the floor of the pelvis. Hence, whenever the vertex presents, it is easily detected through the inferior portion of the uterine wall, unless, indeed, it should be retained at the superior strait by a considerable inclination of the womb, or by a malformation of the pelvis.

In a word (and this reflection appears to me essentially practical), whenever the accoucheur does not easily reach the presenting part in the last few days of the gestation, and more particularly during the first periods of labor, he should examine the woman very carefully; for it is then exceedingly probable that the head is not at the superior strait; or, even where the cephalic extremity does present flexed, there is reason to fear a wrong direction, or perhaps a faulty organization of the head or pelvis; all which circumstances may subsequently require the intervention of our art. We would, however, remark, that in women who have borne children the head often continues very high up until the end of gestation, and does not get below the superior strait until labor sets in.[1]

---

[1] A variety of circumstances may occur towards the end of gestation, or at the beginning of the labor, dependent on causes wholly foreign to any faulty positions, whereby it might happen that no part could be detected by the touch: thus, 1. It is sometimes observed in women who have had several children, and in whom the fundus uteri is

Supposing the labor has begun, if the finger be introduced through the cervix uteri, it will immediately encounter a rounded, smooth, and resistant surface, which is the anterior side of the head; and then, by directing the index a little further upwards and backwards, in the direction of the sacro-vertebral angle, it will come into contact with a membranous interval, that is, with the sagittal suture.

A vertex presentation is now ascertained; and the next step is to make out the position. For that purpose we first assure ourselves of the direction of the suture, and if it prove to be oblique, running from before backwards, and from the left towards the right, the position must either be the left anterior, or the right posterior occipito-iliac one; but, on the contrary, if it be oblique in the other diameter, the position will either be the right anterior or the left posterior occipito-iliac, &c.

The direction being once determined, we have then only to find out where the occiput lies, to complete the diagnosis; therefore, the finger, by raising up the margin of the os uteri, follows the sagittal suture until it reaches a fontanelle, which is to be distinguished by the characters hitherto described. (See *Head of the Fœtus at Term.*)

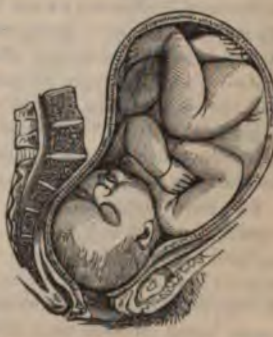
§ 3. MECHANISM.

The mechanism by which the expulsion of the child is accomplished in positions of the vertex is very nearly the same in all cases where the occiput corresponds with one of the points of the left lateral half of the pelvis; but it differs in some respects from that observed in the positions designated as the right occipito-iliac ones.

We must, therefore, examine it in both of these positions; and as, among the admitted varieties, there are two, the anterior in the left occipito-iliac, and the posterior in the right occipito-iliac, which are almost constantly met with, we shall take them up successively as the types of our description.

1. *Mechanism of Natural Labor in the left Anterior Occipito-iliac Position.* (The first, or the left occipito-cotyloid position of authors.)—In this position, the occiput corresponds to the left ilio-pectineal eminence, the forehead to the right sacro-iliac symphysis, and the sagittal suture lies in the direction of the left oblique diameter of the pelvis. (In order to avoid unnecessary repetitions and delays, we premise, once for all, that we shall designate that oblique diameter which runs from the left towards the right side, and from before backwards, as the *left oblique*, and the one passing from the right towards the left, and from in front posteriorly, as the *right oblique diameter.*) The posterior fontanelle is found to the left and in front, the anterior one is behind and to the right. The dorsal plane of the fœtus looks

FIG. 75.



Representing the head in the left anterior occipito-iliac position.

strongly inclined forwards; 2. In cases of twins; 3. In breech presentations; 4. Where there is a large amount of water; 5. Where the uterus is not oval at its inferior part; 6. Where the head is hydrocephalous; and lastly, where the pelvis is narrow. (*Nægèle*, translated by *Pigné.*)

forwards and towards the left side; while its anterior plane is directed backwards and to the right; the right shoulder is in front and to the right side; the left one is behind and towards the mother's left.

Before the bag of waters is ruptured, the child's head is slightly flexed on the front of the chest, and the following are the relations of its diameter with those of the superior strait: the occipito-frontal corresponds to the left oblique of the strait, and the bi-parietal to the right oblique;[1] and, of course, the occipito-frontal circumference of the head is parallel with the periphery of the abdominal strait, and the axis of this strait corresponds with the trachelo-bregmatic diameter[2] of the head.

When the membranes are ruptured, a variable quantity of liquid escapes; then the uterus contracts and applies itself more directly to the fœtal trunk; nevertheless, as but little fluid passes away in vertex positions at this time, there usually remains a sufficient quantity of it to render the pressure of the uterine walls on the child far from being immediate.

After the rupture, the object of the contractions is to expel it from the womb; the fœtus becomes more curved anteriorly, and its superior and inferior extremities more closely folded up; and from that moment, properly speaking, the mechanical phenomena of labor begin.

[The various movements communicated to the fœtus during labor tend to facilitate its expulsion, as will appear from the description of them about to be given under the usual term of the *stages* of labor.

---

[1] We may remark, however, with M. Dubois, that this last relation is not absolutely exact. For instance, if the head of the fœtus at term be found at the superior strait, so that the occipito-frontal diameter is parallel with the left oblique, the shape of the head will prevent the bi-parietal one from corresponding with the right oblique diameter. In fact, in this position the posterior extremity of the bi-parietal diameter is at the left sacro-iliac symphysis, but the anterior extremity, instead of terminating opposite the ilio-pectineal eminence, is found very near the middle of the horizontal branch of the pubis.

[2] M. Nægèle and Professor Dubois (who adopts, at least in part, the views of the Heidelberg Professor) do not believe that the head presents at the superior strait, in the majority of cases, so regularly in all its relations as we have just described, for they say the head does not offer perpendicularly to the plane of the strait, but on the contrary, in an oblique direction; whence the right parietal protuberance, which is also the anterior one, would be lower, relatively to the plane, than the left; and the bi-parietal suture, instead of being found in the direction of the axis of the head, would be a little behind it, according to M. Dubois, and would even look towards the second bone of the sacrum, agreeably to M. Nægèle.

But, notwithstanding these imposing authorities, we believe the occipito-frontal circumference is closely parallel to the plane of the strait in most cases, although the parietal boss is certainly one of the most dependent parts of the head, and the finger first strikes upon it in practising the vaginal examination. But those facts by which M. Nægèle sustains his views prove just the contrary; because the plane of the abdominal strait, being directed very obliquely downwards and forwards, the portion of the head in contact with the anterior arch of the pelvis should be its most dependent part; and further, the finger first encounters the anterior parietal protuberance, because the introduction takes place under the symphysis pubis, that is to say, almost perpendicularly to the superior strait, and therefore the index can only reach, in a very oblique direction, the anterior portion of the head, whose greatest circumference is parallel to the plane of the superior strait.

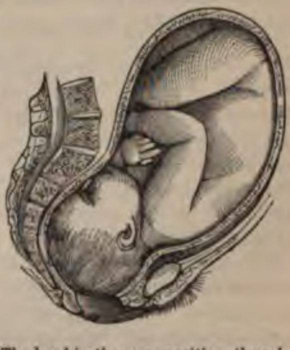
Five principal stages have hitherto been reckoned in vertex presentations; they are, following the order in which they occur: 1st. flexion; 2d. descent; 3d. rotation; 4th. extension or disengagement; 5th. restitution. To these five stages we think it proper to add a sixth for the expulsion of the body. At the end of this chapter (see *Recapitulation of the Mechanism of Labor*), we shall state more fully the reasons which induce us to alter the number of stages as usually described, remarking only for the present, that we think it gives the advantage of a classification which is both more rational and applicable to every presentation. In the account of the mechanism of expulsion for each presentation we shall, therefore, describe six stages.

It will be seen that this innovation does not call for a change in the generally received opinions, inasmuch as we have only to reunite the fifth and sixth stages to restore the old classification.]

These phenomena, or stages of the mechanism, are five in number, as follows: in the first, the head is more strongly flexed on the chest; in the second it traverses all the space between the superior and inferior straits, and reaches the floor of the pelvis; there it experiences a movement of rotation which carries the occiput behind the symphysis pubis, thus constituting the third period; in the fourth, the head undergoes the process of extension, by which all the superior and anterior parts of the vertex and face become completely disengaged at the anterior commissure of the perineum; and then, after its perfect expulsion, the child's cephalic extremity performs a fifth and last movement, designated by Baudelocque as the period of restitution, but which M. Gerdy has proposed to name the *exterior rotation*.

A. *First Stage, or Stage of Flexion.*—After the rupture of the membranes, the fœtal trunk, being compressed on all sides, transmits to the head, through the spine, the impulse derived from the uterine contractions. The head, being forcibly pressed on, has a tendency to clear the uterine orifice, and to engage in the excavation. But it then encounters resistances, either from the os uteri, which is not yet sufficiently dilated, or from the superior strait, or the walls of the excavation; and being thus placed between a power and a resistance, the head must naturally become still more flexed on the chest; in fact, the force of expulsion transmitted by the vertebral column, falling upon the occipital foramen, that is, on a point much nearer to the occiput than the chin, must necessarily (the resistance being equal at the two extremities of the occipito-mental diameter) act more powerfully on the occiput than on the chin; in other words, must press down the occiput into the excavation. But, by depressing this part, the chin is forced to ascend, thus producing the flexion of the head.[1]

FIG. 76.



The head in the same position, though more flexed.

---

[1] In order to prove that the movement of flexion results from the position of the occipital foramen, relatively to the chin and occiput, which represents the two extremities of the lever whereon the spine is articulated, let us suppose, for a moment, that

The head being in this way forcibly flexed, its relations are changed: that is, the occipito-bregmatic diameter has taken the place of the occipito-frontal, and has become parallel to the left oblique of the strait; but the bi-parietal remains unaltered: the occipito-bregmatic circumference is now on a level with the periphery of the strait, and the axis of the pelvis, which before corresponded with the trachelo-bregmatic diameter, now traverses the head very nearly in the direction of the occipito-mental diameter.

This movement of flexion, therefore, evidently places the child's head in the most favorable position for its passage, by constraining it to offer its smallest diameters to those of the pelvis.

B. *Second Stage, or Stage of Descent.*—The head, pressed on by the contractions, enters the excavation and reaches the floor of the pelvis. In making this descent, the occiput presses in front against the internal and anterior face of the body of the ischium, the obturator internus muscle, and the external obturator vessels and nerves, which pass out through the upper part of the obturator foramen; while the forehead or bregma presses behind on the internal border of the psoas and pyramidal muscles, the sciatic plexus of nerves, together with the gluteal and the internal pudic vessels and nerves. The left side of the head likewise comes into mediate relation with the same parts, and also glides over the anterior surface of the rectum. But the descent of the head is not completed until the occipito-bregmatic circumference is nearly parallel to the plane of the inferior strait: that is, when the two parietal protuberances have attained this level. Now, it is evident that, to reach this point, the left parietal boss (which is found behind) must traverse the whole anterior face of the sacrum, whilst the anterior one has only to clear a much shorter space; the first must therefore describe the arc of a much larger circle than the second. Perhaps a more exact idea of the actual movement of the head will be formed by imagining the anterior extremity of the bi-parietal diameter to remain nearly stationary in front and to the right, while its posterior extremity descends rapidly and traverses the whole posterior plane of the excavation.

the vertebral column is attached to the occiput alone, when it is evident that the latter only will descend; on the other hand, let it be made to the chin, which will then descend the first, and lastly let it be done at the centre of the interval between these two extremes, and an equilibrium will be produced, the same as results from equal weights or resistances placed in the dishes of a balance having equal arms. But where the articulation takes place nearer one extremity than the other, the descent will occur at this extremity, just as it would happen in the above-cited balance, if, without altering anything else, the arms were rendered unequal in their length.

To conclude, lest the foregoing should not satisfactorily explain the phenomenon, I propose the following rationale: the head, urged on by the uterine contraction, communicated to it by the spine, meets with resistance from the os uteri, which is not yet sufficiently dilated. Let us change, for an instant, the order of forces, making the vertebral articulation a fulcrum, and the opposition on the part of the neck the power; now, this power is evidently equal in all points of the periphery of the neck; but let us observe that, as the interval between the chin and the occipital foramen is greater than that betwixt the latter and the occiput, the resistance against the chin operates on a longer lever than that against the occiput, and consequently the first must be the more powerful of the two, and therefore it forces the chin to ascend. But raising the latter has the same effect as depressing the occiput: that is, still producing a flexion of the head.

C. *Third Stage, or Stage of Rotation.*—The head, being arrested by the floor of the pelvis, executes a movement of rotation, during which the occiput passes from left to right behind the symphysis pubis, or rather behind the left ischio-pubic ramus, and the bregma rotates into the concavity of the sacrum, though remaining a little towards the right.

The posterior superior part of the right parietal bone then appears plainly under the pubic arch; the posterior fontanelle is behind the ischio-pubic ramus; and the sagittal suture crosses the coccy-pubal diameter very obliquely. Being forced on by the energetic contractions of the womb, the vertex then depresses the soft parts of the perineum, and by gradually distending them, succeeds in converting the pelvic floor into a part of a canal which prolongs the posterior wall of the pelvis downwards and backwards. It is during this time that the rotation is accomplished: that is, the sagittal suture becomes parallel with the antero-posterior diameter of the inferior strait. The occiput engages in the arch of the pubis, and projects beyond the lower part of the symphysis, until the back part of the neck comes into contact with it, when the anterior progression of the occiput is arrested.

D. *Fourth Stage, or Stage of Extension.*—Just at the moment when the occiput engages in this manner in the pubic arch, the shoulders and upper part of the body enter the excavation, and in engaging there, the fœtal trunk, which is flexible, accommodates itself to the direction of the canal, and consequently bends over a little on its posterior plane.

[The head then presses upon the perineum, distending it and transforming it into a groove or gutter which conducts the occiput to the vulvar opening, so that if the patient be uncovered the accomplishment of the fourth stage may be witnessed by the observer. At each contraction the head descends and the perineum is elongated; then, as the pain subsides the perineum contracts, at the same time pressing the head a little upward. Finally, during a fresh effort the vulva opens and the occiput shows itself beneath the arch of the pubis. At this moment the head is still flexed, but soon the nucha seems to fix itself behind the pubis, and the head, by executing a movement of extension, escapes completely from the vulvar orifice, bringing successively into view after the occiput, the vertex, forehead, nose, mouth, and chin; the latter, which is the last to emerge, remains applied against the posterior commissure of the vulva and directed toward the anal region.

This movement has received what seems to us a curious explanation, for, according to the commonly accepted view, the pressure transmitted by the spinal column to the head is divided at the occipital foramen into two forces, one of which is applied to the occiput, and the other to the chin. Therefore, when the occiput is engaged beneath the pubic arch, the portion of force which is transmitted to it is lost upon the point of contact between the vertebral column and the posterior part of the pubis, whilst the force directed upon the chin continuing to act depresses it, causing it to depart from the breast and thus producing the movement of extension.

Now, this explanation seems to us fallacious; for is it not evident that whilst the occiput is beneath the pubic arch, all the soft parts which make up the perineum press the anterior part of the head against which they are applied upward and backward, so that the movement of flexion is, at this juncture, at its utmost limit?

Our own view of the disengagement of the head is as follows: The body descends into the cavity of the pelvis, whilst the head is depressing and distending the perineum, and the chin remains applied to the breast not merely until the moment when the occiput takes its place behind the pubic arch, but even until the bregma makes its appearance at the posterior commissure of the vulva. Then it is that the perineum acts like an elastic splint which, on the one hand, presses the head upward beneath the pubic arch, whilst on the other it slips rapidly over the face which it leaves uncovered, and retracts toward the coccygeal region where it is attached.

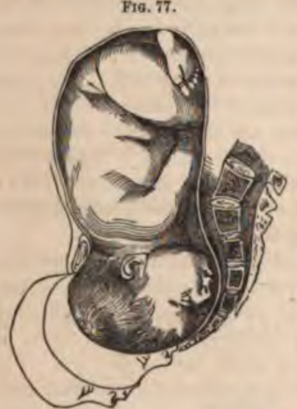
The disengagement of the occiput and vertex begins only when the head is pressed downward sufficiently by the body; but at this moment the perineum, which until then was but passively distended, resumes its action and retracts as just stated, imparting to the whole head, whilst slipping over the face, a movement of extension which has the arch of the pubis for its centre. Therefore, it is only in this second period of the process of disengagement of the vertex, that the movement of extension is truly evident.

If the perineum were entirely absent, the head would disengage at the outlet of the inferior strait, without exhibiting its movement of extension. In the normal condition, however, and especially in primiparæ, the perineum, converted into an elongated gutter, arrests the downward progress of the head and directs it forward as upon an inclined plane.

Do we not also know that in breech cases, especially in primiparæ, the pelvic extremity in emerging from the vulva is directed just as obliquely upward and forward as the lateral flexion of the body will allow? This flexion, which no one will deny to be produced by the soft parts of the perineum, is, in our opinion, sufficient to prove that the movement of extension in delivery by the vertex is effected only by the curvature and elasticity of the genital passages, for, if the movement of the head at this time is very extended, it should be attributed to the great mobility of the articulations which permits the occiput to rise up in front of the pubis. In breech cases the same phenomenon occurs, though the extent of motion is greatly restricted by the rigidity of the spinal column in the lumbar region.]

Whatever explanation be accepted, if we observe what takes place during this movement of extension, the following points are seen successively to appear at the anterior commissure of the perineum, viz., the bi-parietal suture, the bregma (or fontanelle), the coronal suture, the nose, mouth, and, last of all, the chin. During this process, the sub-occipito-bregmatic, the sub-occipito-frontal, and the sub-occipito-mental diameters successively pass the antero-posterior diameter of the inferior strait. As soon as the occipito-bregmatic circumference is beyond the vulva, the anterior border of the perineum, yielding to its natural elasticity, retracts strongly, slips over the face, and embraces the neck; and just at that moment the head, which was before forcibly turned up in front of the mons veneris, falls back from its own specific weight, towards the anus.

FIG. 77.



The head is seen in various degrees of extension, the nape of the neck resting first behind, and then under, the symphysis pubis.

E. *Fifth Stage, or Stage of Exterior Rotation.* (Restitution.) — The head remains for a few seconds in this position, and then it is seen to describe a fifth and last movement, namely, the occiput inclines towards the internal surface of the left thigh, and the face turns towards the right thigh. This process is usually denominated the *restitution*, for the following reason: Before the researches of M. Gerdy, it was generally supposed that when he head executed its movement of rotation within the pelvis, the trunk id not participate therein, and that the operation could only take place rough the aid of a certain degree of torsion in the neck; and, further, at the head becoming completely disengaged, the neck untwisted, and the ad was *restored* to its natural relations with the trunk.

M. Gerdy was the first to demonstrate the faultiness of this explanation; r, in fact, the trunk does participate in the head's rotation, in such a way at the shoulders, which, in the beginning of labor, corresponded to the lique diameter, are nearly transverse after this movement (the right oulder, nevertheless, remaining always a little more in front than the ft). The shoulders then reach the inferior strait in a transverse position, esenting, therefore, their great, or bis-acromial diameter, to the smallest e of this strait; but here they encounter some resistance, under the influ- ce of which the rotation is effected in the opposite direction to that of the ad; the right shoulder, passing from the right side towards the left, proaches the apex of the pubic arch, while the left one gets into the rineal concavity, and the head, being free externally, necessarily follows e movement communicated to the shoulders.

The rotation of the head is not therefore an isolated movement peculiar itself, as Baudelocque supposed, but one secondary to the rotation of the oulders.

I must remark, however, that, in some cases, the head has appeared to e to execute a double movement; for, immediately after its expulsion, it rns very slightly; the occiput passing a little to the left, the forehead wards the right; after remaining some seconds in this position, it then dergoes the secondary movement just described, which is due to the rota- n of the shoulders. The first of these movements has already seemed to to result from the untwisting of the neck, and is the true movement of titution of Baudelocque.

F. *Sixth Stage, or Stage of Expulsion of the Body.*—The shoulders present the inferior strait soon after the head, and, as we have just stated, nearly ways in a transverse position. The right one gets under the right ischio- bic ramus, while the left one lies in front of the left sacro-sciatic liga- ent. The bis-acromial diameter is rarely found in the direction of the tero-posterior diameter of the inferior strait. The anterior or sub-pubic oulder is the first to appear in the vulvar fissure; although, as a general le, the posterior one, after having traversed the perineal curve, is first engaged at the anterior commissure of the perineum, and the right one subsequently delivered.[1]

Contrary to the generally received opinion, M. P. Dubois supposes that the anterior ulder is the first delivered. That is certainly true in a great number of cases, but have most usually observed the opposite fact; besides, there is a theoretical view ch militates in favor of our opinion, that is, the left shoulder, being placed in con- with the posterior plane of the excavation, is situated, much more than the ante- *one*, in the direction of the uterine axis, or the axis of the superior strait, and efore being subjected to a more energetic uterine impulse, consequently must be vered first; further, it was necessary this should be so, as the posterior shoulder much the longer course to traverse. Again, if I might refer to my own observa- s, I would say that in women who have before borne children, more especially in

During the disengagement of the shoulders, the fœtus becomes flexed on its right lateral region so as to accommodate itself to the curvature in the pelvic canal; and very soon after the remainder of the trunk is expelled, sometimes describing a very prolonged spiral course in its passage.

2. *Mechanism of Natural Labor in the right Posterior Occipito-iliac Position.* (The fourth of Baudelocque, and the third of M. Capuron.)

In the vast majority of cases, the mechanism of labor in this position scarcely differs from that just described, and therefore we only need allude here to the principal peculiar phenomena of the travail, without repeating all the preceding details.

It, likewise, is composed of five periods, or stages; before the membranes are ruptured, the diameters of the head correspond with the same diameters of the pelvis, as in the foregoing case, and the only difference to be remarked is, that the occiput corresponds to the right sacro-iliac symphysis, and the forehead to the left ilio-pectineal eminence. The child's posterior plane looks backwards and towards the mother's right, while its anterior plane is in front and to her left; its left side is placed in front and on the right, its right side behind and to the mother's left.

A. *First Stage, or Stage of Flexion.*—The head is flexed by the same forces as in the preceding case, and this flexion determines similar changes in the relations of its diameters with those of the pelvis.

B. *Second Stage, or Stage of Descent.*—This stage presents nothing worthy of particular notice.

C. *Third Stage, or Stage of Rotation.*—The head having reached the floor of the pelvis, undergoes a movement of rotation, in consequence of which the occiput traverses the whole right lateral moiety from behind forwards, in such a way that it passes successively towards the right extremity of the transverse diameter, behind the cotyloid cavity and under the right ischio-pubic ramus, while the forehead, or bregma, revolving in an inverse direction, goes from before backwards towards the hollow of the sacrum; and thus, the position which was originally occipito-posterior, becomes converted into an occipito-pubic, or anterior one, and the labor then terminates just as it does in those cases where the occiput was primitively in front.

[D. *Fourth Stage, or Stage of Disengagement.*—This presents nothing peculiar.

E. *Fifth Stage, or Stage of Restitution.*—The movement in this case is entirely analogous to that already described in connection with the left anterior occipito-iliac position, and is due to the same causes. It is the left shoulder, however, which gets behind the arch of the pubis, and the occiput is directed toward the right thigh.

F. *Sixth Stage, or Stage of Expulsion of the Body.*—This takes place under the conditions already described.]

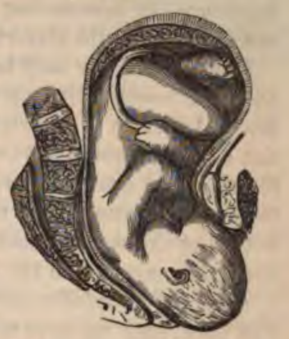
Irregularities in the Disengagement.—In some instances, which are rare, however, this conversion does not take place, and the occiput remains behind until the termination of the labor. The delivery is then concluded in the following manner: the head is strongly flexed on the chest, and re-

---

those who have suffered from rupture of the perineum in former labors, the posterior shoulder is the first delivered; and, on the contrary, in primiparæ, the sub-pubic one has the precedence, the other being retained by the resistance from the soft parts.

tains its oblique position; the forehead, corresponding to the body of the left pubis, first reaches the inferior strait, and the left coronal boss then engages under the pubic arch, where we can sometimes distinguish the superciliary ridge just below the symphysis; and I even saw the upper eyelid in one case. But though the forehead first appears at the exterior, the occiput, urged on by the spine, which transmits the force of the uterine contraction, traverses the whole curvature of the perineum (which is greatly distended in such instances), and becomes disengaged the first at the anterior commissure. While the occiput is thus passing over the anterior surface of the sacrum and perineum, the coronal boss and eyebrow, that originally appeared at the vulva, reascend and become concealed behind the symphysis.

FIG. 78.



Disengagement of the head in the occipito-posterior positions.

The occiput is scarcely clear, when the perineum by gliding over the inclined plane formed by the nape of the neck, retracts strongly, and thus facilitates the subsequent delivery of the anterior portions of the head; therefore, the head may be observed to undergo the process of extension around the nape as a centre, and to appear below the symphysis in the following order: namely, the anterior fontanelle, the coronal suture, the forehead, nose, mouth, and chin.

Lastly, the head, placed in the right posterior occipito-iliac position, may, when once down in the excavation, depart from the chest, and the vertex presentation be thus spontaneously converted into one of the face, at the inferior strait; we witnessed a case of this kind at the Clinique in 1838.

This transmutation takes place, says M. Guillemot, in the following manner: the occiput being arrested by some point on the posterior part of the excavation, instead of advancing along the perineum towards the inferior strait, ascends in the curvature of the sacrum by executing the movement of rotation backwards, and being at the same time thrown back upon the posterior part of the chest. While this is going on, the forehead and face descend behind the pubis and pass downwards and backwards, until the chin engages under the arch, and then the head, which is completely turned back, traverses the perineal strait, as in a face presentation.

The disposition which the inclined plane of the cervix uteri impresses on the vertex in this position, continues M. Guillemot, is a *frequent* cause of a similar transmutation above the abdominal strait. The slight backward inclination of the head, which always exists in these positions, may correct itself when the uterine contractions, by acting on the fœtus, keep the chin applied to the neck; but, on the other hand, the reversion may be carried still further, or be entirely completed, if any obstacle impedes the descent of the occiput into the excavation; finally, in cases of uterine obliquity, where the inclination of the vertex is greater, the backward tendency, instead of disappearing, would be increased, and the occiput would then ascend and the forehead descend.

Like the author quoted, I admit the fact, though I think it rare; but I cannot acknowledge, like him, the truth of the following proposition, *i. e.* that if the conditions of transmutation which then exist may be appreciated by a comparison of the face labors with those of the occipito-posterior positions, we should not depart far from the truth (*I believe it would be a wide departure*) by announcing that, in every three occipito-posterior positions, one of them would give rise to a face presentation.

Lastly, whatever may be the mode of the delivery of the head in the right posterior occipito-iliac position, the occiput always inclines towards the internal surface of the right thigh, and the face is directed to the left one; this external movement (*restitution*) results from the internal rotation of the shoulders, in consequence of which the left shoulder, which was originally the anterior, gets under the arch of the pubis, and the right one into the hollow of the sacrum, and then the shoulders and the remaining part of the trunk are expelled in the manner already stated.

Observations relative to the Mechanism of Delivery in Vertex Presentations.—The great care we have taken in describing the natural labor in these two varieties of the two fundamental positions, will absolve us from repeating it anew in the other varieties.

In fact, the left *transverse* occipito-iliac position does not differ from the *anterior* one; unless, perhaps, the movement of rotation, which brings the occiput in front, is somewhat more extended; and what we have stated concerning the two modes of termination in the *right posterior* occipito-iliac position applies equally well to the *left posterior* one; but we must add that the movements of rotation will then take place from left to right, since the occiput is primitively turned towards the left side.

Lastly, in the other two varieties, the *right anterior* and the *right transverse* occipito-iliac ones, the mechanism is still the same as in the corresponding varieties of the left occipito-lateral position, the occiput, however, turning from right to left so that the rotation occurs toward the right thigh.

From the foregoing, the reader will see that, in order to study the mechanism of labor in the vertex positions, we have been obliged to consider each of the periods, or stages, composing it separately. Thus, we first examined the movement of flexion, then of descent, next the internal rotation, the extension, and the external rotation; but it must not be supposed that these different movements occur successively, one after the other, in the order just described.

1. The forced flexion spoken of as happening before the descent, frequently only takes place simultaneously with the latter. Often, indeed, the head is not flexed until the descent is completed, and it encounters the resistance from the floor of the pelvis; and then only, in the majority of cases, is the flexion carried to its highest degree. We can imagine that this would nearly always be the case, since the head is engaged in the excavation in most women long before the commencement of labor; and even in those cases where it is still above the superior strait at the time of the membranes being ruptured, the presenting diameters will allow it to traverse the upper part of the excavation without meeting any marked resistance.

The movement of flexion likewise presents some irregularities: for instance, it is not at all unusual, more especially in the occipito-posterior positions, for the chin, instead of approaching the chest, to depart from it; and, consequently, for the head to become more extended, and the anterior fontanelle gradually so get towards the centre of the excavation. However, this anomaly is usually temporary, for the head is flexed anew when it reaches the pelvic floor.

In some rare cases, the opposite of the preceding, the posterior fontanelle occupies the centre of the excavation, either because the flexion has gone beyond its usual limits, or else, because the trunk is inclined backwards; but here, also, the resistance from the perineum gradually brings back the head to its regular situation. (P. Dubois.)

2. The rotation sometimes commences prior to the arrival of the head at the inferior strait, and before the descent is completed. So that, in such cases, the three first stages of the labor occur at the same time; thus the head is flexed, descends, and rotates all at once.

Some curious varieties of rotation are occasionally met with, which should be known to the student. For instance, it may be incomplete, the head still retaining a great obliquity pending the whole duration of its disengagement; or it may not take place at all, which happens, as we have already seen, in certain occipito-posterior positions, or it may also occur in the transverse ones. In this latter variety, which is the rarest of all, the occiput and the forehead disengage alongside of the internal surface of the ischiatic tuberosities; the occiput escapes first, and then the forehead by a movement of extension analogous to the ordinary mechanism. Madame Lachapelle reports having observed three cases of this kind. In some exceptional instances, the rotation exceeds the ordinary limits: thus, for example, if the occiput is placed in relation with the right sacro-iliac symphysis at the beginning of the labor, it may successively correspond with the right extremity of the transverse diameter, the posterior face of the right acetabulum, the symphysis pubis, and the *left cotyloid cavity;* and then, after a moment of repose, it retrogrades and places itself once more behind the symphysis. M. P. Dubois originally pointed out this fact, and I have twice since had an opportunity of verifying its truth.

Again, the rotation, by which the occiput is brought in front, sometimes only takes place just as the head is overcoming the final resistances from the soft parts; on one occasion, I observed and pointed out this fact, in a primiparous woman, to all the students then present at the Clinique; the child's head was in the right posterior occipito-iliac position, and it had descended to the pelvic floor and had cleared the inferior strait without rotation taking place; the perineum was forcibly distended, the vulva widely dilated, the parietal protuberances were engaged, and the occiput had but a few lines to pass over in order to escape at the anterior perineal commissure; when, under the influence of a new pain, the head rotated briskly, the occiput gained the front, the forehead simultaneously rolling into the perineal concavity, and the labor terminated almost immediately.

The rotation within the excavation is certainly one of the most curious movements executed by the fœtal head during the whole process of a natural labor; indeed, from what we have hitherto stated, it must be evident that, whatever be the primitive relations of the occiput with the various points of the circumference of the superior strait, it finally succeeds in getting under the symphysis pubis.[1] Now, the physical cause of this movement is nowhere given in the writings that have been published on the subject prior to M. P. Dubois, who has paid particular attention to this point, and who, after refuting the influence of the inclined planes, advanced by the older accoucheurs, as the cause of the movement, adds, "This cause evidently resides in the combination of a great number of elements, viz., on one hand, the size, form, and mobility of the parts which are expelled, and, on the other, the capacity, the shape, and the resistance of the canal traversed by them; and such is the influence of this association, that the fœtal parts place themselves in the most favorable conditions for delivery; thus, if an active resistance is made to them at one point, they withdraw from that, and seek another where there is more space and liberty. The mobility of the traversing parts, and the extreme lubricity of those which are traversed, *render all this very simple and intelligible.* In fact, every accoucheur must have remarked that, in those instances where the sacro-pubic diameter is contracted, the fœtal head, if oblique before the labor, constantly places itself then in a transverse direction, that is, in the one offering the least possible dimension to the shortened diameter; and this fact is nothing else than a very simple effect of those same causes, of which the rotation, when extensive, is a very complicated consequence." (*Journal des Connaissan Médico-Chirurgicales.*)

M. P. Dubois further relates the following experiment in support of explanation of the process of rotation: "The flaccid and voluminous uterus of a woman, who died soon after delivery, was freely opened near the uteri, and her fœtus was placed in it near the soft, gaping orifice, in the right posterior occipito-iliac position of the vertex; then several midwife students, by pushing the child from above downwards, caused it to enter the excavation without difficulty; but it required a much greater effort to make the head traverse the perineum and clear the vulva; and it was not without some surprise that we noticed, in three different trials, that, as soon as the head passed the external genital parts, the occiput was in front and to the right, while the face turned backwards and to the left. Again, we repeated the experiment a fourth time; but now the head passed the vulva, with the occiput remaining posteriorly. We then took a still-born child, delivered the preceding day, which was much larger than the other, and placed it in the same conditions as the first, and on two successive trials the head cleared the vulva after having performed the rotation; on the third and succeeding essays it was disengaged without executing this movement: that is, the process of rotation continued until the perineum and vulva had lost the power of resistance that produced it, or which, at least, had determined its accomplishment." (*Loc. cit.*)

---

[1] M. Nægèle has only known the occiput to disengage posteriorly seventeen times out of twelve hundred and forty-four occipito-posterior positions; and even in those cases it was always possible to appreciate the exceptional circumstances that had favored this irregularity: such as, an amplitude of the pelvis, or numerous former labors, lacerations of the perineum, or the softness, flexibility, *reductibility*, and want of consistence of the head, or an extreme smallness of the child, the presence of twins, &c., &c.

I do not know whether the explanations and experiments of M. P. Dubois will render the cause of rotation *very simple and intelligible* to every reader; but, as to myself, I am constrained to admit that they describe and confirm the fact, but that they do not explain it. True, there can be no doubt that the cause of rotation is to be sought for in the form and direction of the canal, and in the shape and size of the fœtal head; but let us see if it would not be possible to ascertain the influence of those divers circumstances more precisely.

The uterus is situated very nearly in the axis of the superior strait, and therefore the sum of its expulsive forces, or, to speak more clearly, the sum of the contractions, may be represented as operating according to the direction of its axis. Now, supposing the head to be in the right posterior occipito-iliac position, the occiput, urged on by the uterine contraction transmitted by the spine, will descend in the line of its axis: that is, from above downwards, and from before backwards; and it will continue on until it is arrested by the resistance from the inferior and lateral parts of the pelvis, or from the soft parts constituting the floor of the perineum. There it is arrested, provided the resistance be considerable, and thenceforth the occiput must necessarily change its direction. In fact, the resistance may be represented by a force operating in a direction perpendicular to the surface whereon the head strikes, and which is applied to the fœtal cranium at its point of contact with the posterior plane of the excavation. This point of contact, in the case before us, is evidently the right lateral and posterior part of the head, which strikes against some point in the hinder wall of the excavation; the child's head, or rather the occipital extremity of it, is from that time subjected to two different forces, one of which acts from above downwards, before backwards, and slightly from left to right (this is the uterine contraction); and the other from behind forwards, and a little from below upwards (this is the resistance, or force, represented by the perpendicular to the surface impinged upon by the head). By representing this force derived from the resistance, and that from the uterus communicated through the spine in the line of axis of the superior strait by a parallelogram, we obtain a diagonal or resultant from these two forces that points out the direction of the movement that is to take place. Now, by constructing such a parallelogram, we observe that the occiput must evidently pass forwards, downwards, and to the right; since the diagonal or resultant of the forces is directed from behind forwards, from above downwards, and from left to right.[1]

The extent of this downward progress, and the rapidity of its execution, are always proportionate to the energy and duration of the contraction, and to the resistance offered by the pelvic floor. This also explains why the rotation, after being a long time delayed, is sometimes suddenly and completely effected during a violent pain; as also why, under other circumstances, and more particularly in those instances where the pains are feeble or short, this movement only takes place gradually, and requires for its entire completion a much longer period and more numerous contractions.[1]

---

[1] In an article published in 1846, two years after the appearance of my first two editions, Prof. Simpson advanced nearly the same theory, adding that no one had before given a satisfactory explanation of this movement of rotation. Though glad to find my theory confirmed by that of the learned Edinburgh Professor, I am sorry to have to remind him that my first edition was published in 1840.

Lastly, this theory enables us to explain those differences noticed in the rotation according to the part of the excavation where it commences; thus, it has been stated that usually the process only begins when the child's head reaches the pelvic floor; indeed, this could hardly be otherwise, since until that period the head, from being strongly flexed, and offering its smallest diameters to those of the strait, had encountered no resistance whatever from the osseous portion of the pelvic canal; but we can readily imagine that if the head be voluminous, the pelvis rather small, the superior strait too much inclined, or the uterus too oblique, the resistances might be felt much sooner, and the occiput hardly have entered the excavation, before it would strike against the posterior wall and be compelled to follow the new direction impressed upon it by the resultant (diagonal) of the forces.

This explanation accounts readily for the absence of rotation, and the disengagement of the head in the posterior position. What, according to M. Nægèle, are the kinds of cases in which this exception has been observed? We have already stated them: they are those in which the large size of the pelvis, the slight resistance of the soft parts, occasioned by previous labors or ruptures of the perineum, or else the small size of the fœtus, or the reductibility of its head, permit its passage through the canal without encountering resistance, and, consequently, without any alteration of the first direction of the uterine force by a new one.

3. The trunk participates, as we have elsewhere stated, in the rotation of the head; this, however, may not occur; at least two cases reported by M. P. Dubois would seem to prove as much.

4. The rotation of the shoulders after the head is delivered may also present two opposite conditions; that is, it may either take place in a partial manner or else not at all, the shoulders then disengaging transversely. This last circumstance is not very unusual, and, in my opinion, clearly tends to confirm the views of M. Gerdy on the process of rotation; for when it does not occur, the head undergoes no rotation. But the latter should always execute this movement, however great the immobility of the shoulders, if the process is a consequence, as Baudelocque supposed, of the untwisting of the neck.

---

[1] This movement takes place gradually, says M. Nægèle, in a slow spiral direction; for if the vaginal touch be resorted to during the pain, the small fontanelle, which was originally directed to the right and posteriorly, will then be found to place itself altogether to the right, towards the descending branch of the ischium; but, in proportion as the pain diminishes, it returns step by step to the place it occupied before. Again, if the finger be kept in contact with the head, the posterior fontanelle, which in the absence of a pain is wholly to the right, will be observed, during the latter, to turn forwards towards the obturator foramen, from whence it again departs as the pain goes off; and it keeps up these alternate movements for some time, until finally it becomes fixed opposite this foramen.

Sometimes, on the contrary, the same movement that rendered the shoulders transverse before the delivery of the head continues after the expulsion of this latter in such a way, that the shoulder which was originally anterior, instead of retrograding towards the pubic arch passes behind, while the other that was primitively posterior gains the apex of this arch, and the face then turns towards the internal surface of the right thigh in the right occipito-iliac, and to the left thigh in the left occipito-iliac positions.

§ 4. INCLINED, OR IRREGULAR VERTEX PRESENTATIONS.

Under the name of inclined, or irregular presentations of the vertex, we have designated those (page 311) in which the sagittal suture, instead of being placed very nearly in the axis of the superior strait, looks either to the fore or hinder part of the pelvis, as well as those in which the forehead or the occiput is placed at the centre of the strait, in consequence of the incomplete or exaggerated flexion of the head. Baudelocque and his school have considered these as so many distinct presentations, which they have accordingly denominated the presentations of the side of the head, or ear, forehead, and occiput; but we shall follow the example of Lachapelle, Nægèle, Stoltz, and P. Dubois, by including them all in the general term of vertex presentations. In fact, they scarcely ever impede the course of the labor, and seldom modify its mechanism.

For example, let us take the first position (the left anterior occipito-iliac), and suppose it to be inclined on its anterior (right) parietal region; then the right parietal protuberance corresponds to the centre of the strait, and the sagittal suture looks towards the first bone of the sacrum. When the contractions take place, the head will descend just as in a natural position, excepting that, upon its entrance into the excavation, or during the first half of the descent, it will undergo a movement of correction, in consequence of which the posterior parietal protuberance will describe an arc of a circle around the anterior one as a centre, and both will soon appear on the same plane, and the labor terminate as usual. Of course, this process of correction would operate in the opposite direction if the inclination were on the posterior parietal region instead of the anterior; however, the rectification is then much more difficult, owing to the direction of the expulsive force, which has a continual tendency to augment the inclination.

In those cases where the flexion of the head is incomplete, as in the forehead presentations of Baudelocque, it will become perfected during the descent, and the same will occur when it is exaggerated (the presentation of the occiput of Baudelocque); the forehead becoming lower and lower.

§ 5. PROGNOSIS.

The vertex presentations are the most favorable of all, and this statement will be more fully verified when we study the prognosis of the other presentations.

But the vertex positions are not all equally advantageous; and we may lay it down as a general proposition that those in which the occiput is turned towards some point of the anterior half of the pelvis, at the beginning of the labor, are more favorable than those in which it looks posteriorly.

In occipito-posterior positions, the head, in the early part of the labor, generally remains quite high and less flexed than when the occiput is in front, a fact shown by the difficulty then experienced in reaching the posterior fontanelle. The descent, also, is very slow, and barely complete until rotation has brought the occiput in front.

In the latter case, as hitherto demonstrated, the labor may terminate by two varieties of mechanism which are altogether different from each other: that is, the occiput either comes in front, so as to get behind the symphysis pubis, or else it remains posteriorly throughout the labor.

Whenever the posterior position converts itself into an occipito-pubic one, the very considerable extent of the rotation then demands a rather more energetic contraction on the part of the womb than where the occiput was originally nearer to the anterior arch of the pelvis, and the labor is, therefore, somewhat more painful, though in general it is not serious.

But the expulsion becomes particularly difficult when the head maintains its primitive position, and does not rotate, as we shall endeavor to prove; though first, let us establish as an axiom, the evidence of which no one can deny, that *whenever a straight and an inflexible trunk has to pass through a curved canal, it will do so the more readily as the canal is shorter and less curved, or the trunk itself is the more diminutive.*

Now, in the folded condition exhibited by the child's body in vertex presentations, the trunk, which represents the great longitudinal axis, may be divided into two portions; one of which, constituted by the spine and the inferior extremities, is flexible, and can accommodate itself to the pelvic curvature, and, therefore, its expulsion should offer no difficulty; while the other, corresponding to all the space between the vertex and the atloido-axoid articulation, forms a straight, inflexible stem. Now, it is evident that in the primitive occipito-anterior positions, or in the posterior ones, which afterwards become converted into anterior, that portion of the straight inflexible stem which the long axis of the fœtus represents, is reduced to its smallest possible dimensions, and it only has to traverse *the shortest and least curved part of the canal,* I mean the symphysis pubis; whence one extremity is clear at the inferior, while the other is scarcely engaged at the superior strait. But does the same thing occur in those occipito-posterior positions that remain posterior until the end of the labor?

We know the occiput, in this latter case, is the first to escape at the anterior perineal commissure, and it therefore has to traverse all the front surface of the sacrum and of the greatly distended perineum. But as the child's neck is not long enough to thus measure the whole posterior wall of the pelvic canal, the chest must engage in the excavation soon after the head, and the latter, as a necessary consequence, must be forcibly flexed on the breast. Owing to this forced flexion, the straight inflexible stem extends not only from the vertex to the atloido-axoid articulation, but even to the first dorsal vertebra, and it is, therefore, *much longer* than usual; yet more, it has to traverse the whole anterior face of the sacrum prolonged by the perineum, that is to say, *the longest and the most curved part of the pelvic walls.*

Whence it is evident that the expulsion of the fœtus in this case must be much more tedious and painful than in the others; however, we cannot admit that the delivery is absolutely impossible. M. Capuron, who still professes this latter belief, supposes (the occiput remaining posteriorly) that the labor can only take place when the fœtal head is unusually small, or the pelvis very large; but this opinion is opposed at the present day by too great a number of facts, to require us to refute the theoretical proofs upon which he relies.

There is yet another reason for the occipito-posterior positions being more difficult than the anterior ones; a reason to which sufficient importance has not, in my estimation, been attached: I allude to the mode in which the uterine contractions are transmitted. Observe, in fact, when the occiput is in front, that these are communicated to it by the spine, nearly in a direct line, whilst they only reach it when this part is posterior at the close of labor, by describing a well-marked curve, owing to the extreme flexion of the head on the chest.

Hence, there would be, as every one knows, a great loss of force; and observe further, that such loss coincides precisely with an occipito-posterior position, which, for the reasons before stated, occasions, of itself, still greater difficulties in the delivery.

Now, to have demonstrated that the labor is longer and more difficult in those cases in which the occiput remains posteriorly, is, in effect, to prove that it was at the same time more dangerous both to the mother and child.

In fact, it is in such instances especially that a rupture of the perineum is to be feared; it being very difficult indeed to prevent such an accident; it is then, also, those central lacerations of the perineum are apt to take place, in which the posterior commissure of the vulva and the sphincter ani remain intact, while the fœtus forces a way for itself through the distended perineum.

Such, indeed, is the effect of the length of the straight stem represented by the fœtus, and of the length of the curve represented by the canal, that in order to accomplish expulsion it becomes necessary either: 1. That the straight stem should break, or bend, so as to accommodate itself to the curvature of the canal, which is impossible; 2. That the curved canal should be straightened out; 3. That the walls of the canal should be ruptured; 4, or finally, that the delivery should become impossible.

Happily, in the majority of cases, the soft parts which form the continuation of the posterior wall, allow themselves to be straightened out; but when they resist, nothing but their rupture can allow of a spontaneous delivery, their considerable thickness affording the only explanation of the rarity of this accident.[1]

The head, by remaining a long time in the excavation, compresses the neighboring parts, thereby giving rise to retention of the urine, to eschars, and to urinary or stercoral fistulæ.

And apart from all these inconveniences, it is well known that the labor cannot be prolonged without danger; that the woman becomes fatigued and exhausted, and that the child remains compressed and painfully flexed.

[1] For an idea of the resistance sometimes presented by the perineum, see the article in the fifth part of the book, on The Application of the Forceps in Occipito-posterior Positions.

It has always seemed to me that in occipito-posterior positions, the left one is attended with much greater trouble than the right, the engagement of the head being generally more difficult, and its rotation much slower. Quite often, indeed, the occiput remains behind, preventing, in first labors, a spontaneous delivery, besides rendering much more difficult the application of the forceps, which then becomes necessary.

Whenever a fœtal head is examined, just after its delivery in a vertex position, there is always to be found a more or less considerable tumefaction on some point of the vertex, provided the labor has lasted long after the membranes were ruptured; and the size of this tumor bears a direct proportion to the more or less rapid progress of the labor. Its seat is so constant that it is easy to determine in what position the child was born by a simple inspection.

For instance, when the occiput escapes under the pubic arch, the tumor is always located on the superior posterior angle of one of the parietal bones, *i. e.* on the right parietal in the left occipito-iliac, and on the left one on the right occipito-iliac positions; and in those rare cases, where the occiput is disengaged posteriorly, it is usually situated about the centre of the vertex, often indeed on the anterior fontanelle; in a word, it is mostly developed at the point which corresponded originally with the os uteri, and subsequently with the void under the pubic arch. The mechanism of its production is very easily understood, for the whole circumference of the head is strongly compressed, leaving only a single point corresponding to the void in the pelvis or arch, which is not subjected to that pressure, and which must, therefore, become the seat of a sero-sanguinolent infiltration, just in the same way as the skin does, when, by the application of a cupping-glass and the creation of a vacuum, it is thereby protected from the atmospheric pressure that operates on every other part of the body.

This tumor, when large, is the result of a slow and painful labor; it is always single; and may be distinguished from the cephalæmatoma, with which it was for a long time confounded, by the following characters: the former (or the tumefaction caused by labor) is irregularly circumscribed, whilst the limits of the latter are very distinct; in the former, the hairy scalp is of a well-marked violet color, the tumefaction has an œdematous consistence, retaining the impression of the finger, and is not fluctuating, whilst the skin of the cephalæmatoma is colorless, presenting a well-marked fluctuation, occasionally even some pulsations, and its base is limited by a prominent osseous border;[1] in some instances, however, this border is not developed for several days after the commencement of the disease; but the pulsations and the border are never met with in the other variety.

Lastly, the semi-sanguineous œdema of the cranium in new-born children appears immediately after birth, and disappears in from twelve to forty-eight hours; but the cephalæmatoma, on the contrary, though it may exist at the moment of birth, scarcely ever appears until some hours after the delivery, and then lasts for several weeks.

---

[1] This border is not always present at the beginning of the disease, sometimes not making its appearance until after several days.

Dr. Fortin relates that he was able, in one instance, to detect the presence of a cephalæmatoma as large as a pigeon's egg, before the labor was terminated; and a similar statement has been made by several authors.

The sanguineous tumor just spoken of does not exist when the fœtus dies prior to or during the labor, and before the membranes are ruptured; the inferences which the medical jurist can draw from this fact in cases where it is desirable to fix the period of death of a new-born child, are clearly obvious.

ARTICLE III.

ON THE PRESENTATION OF THE FACE.

It may happen when the cephalic extremity presents at the superior strait, that the head is not only extended, but also turned back towards the posterior plane of the child, which situation constitutes a face presentation. This presentation is very rare; thus, it has been ascertained, from the most numerous statistics, that the fœtus presents by the face, on an average, once in two hundred and fifty to three hundred labors.

We have admitted two fundamental positions for this presentation; in one of which, the chin looked towards some point on the right lateral half of the pelvis, the *right mento-iliac;* and in the other, it was directed to one of the points on the left lateral half, the *left mento-iliac* position; and we may repeat for the face what was said concerning the vertex presentations, namely, that there is no portion of the circumference of the superior strait with which the chin may not be in relation at the commencement of the labor; nevertheless, we shall include all these shades of position in the three principal varieties for each side; that is, for each fundamental one, we have the *anterior*, the *transverse*, and the *posterior* varieties.

The right mento-iliac positions are somewhat more frequent than the left; about in the proportion of thirty-one to forty-one, if we may judge from the statements of Madame Lachapelle. The *transverse* variety is rather more frequent than the right posterior one, which has been considered erroneously as the most common.

The face presentations are either classed as primitive or secondary, according to whether they existed before the commencement of labor, or were the result of ill-directed contractions. In fact, the latter have generally been considered as the more frequent of the two; but we shall have occasion to show the value of this supposition hereafter.

§ 1. CAUSES.

The obliquity of the womb, according to most authors, is the cause of face presentations, though all of them do not interpret its influence in the same manner. According to Deventer, if the womb be inclined to the right side, and the vertex be placed in the left occipito-iliac position, the contractions, taking place in the direction of the uterine axis after the membranes are ruptured, will force the fœtus from above downwards, and from right to left, so that the vertex will strike against the left border of the superior strait, and the head, being thus arrested, will be thrown back upon the posterior plane of the child. Baudelocque, though admitting the right uterine obliquity, supposes that a right occipito-ilial position of the vertex exists at the same time; for, says he, a face presentation is scarcely ever observed, without the obliquity of the womb being on the side which corresponds to the occiput. In this instance, the fœtus is lying on the right lateral wall of the womb before the labor sets in, and the head, obedient to its own specific weight, departs slightly from the chest; but when the contractions manifest themselves after the rupture of the membranes and the discharge of the waters, the direction of the forces transmitted to the head is such that, instead of falling on the occiput, as they would were the head flexed, they are spent on the forehead, and tend to force it down; but a depression of the latter compels the occiput to ascend: that is, causes an extension of the head.

The reader will perceive that all these explanations suppose that the face presentations are uniformly the consequence of deviations from a vertex position; but this, however, is not always the case, for the face may often present directly at the superior strait, even before the commencement of the labor or the rupture of the amniotic sac. For instance, Madame Lachapelle, when making an autopsical examination of two women who died at full term, found the fœtus presenting by the face; moreover, of the eighty-five face presentations collected by the authors of the *Dictionnaire de Médecine*, forty-nine had been clearly made out, and announced as such before the membranes were ruptured; and further, of those eighty-five women, there were but three in whom the uterus was in a state of well-marked obliquity, and only one where the quantity of the amniotic liquid was so great as to attract attention. Whence the conclusion is evident from these and many other facts, that the face presentations, in the great majority of cases, are not determined by a previous inclination of the fœtus, nor by a wrong direction of the uterine contractions, but that they are primitive, and produced by causes which are beyond our knowledge.

The reason for the greater frequency of the right mento-iliac position must evidently be owing, when secondary, to the greater frequency of the right lateral obliquity that produces it. There are several causes, according to Madame Lachapelle, which contribute to render the transverse positions more common than the others: as 1, the form of the superior strait and the length of its diameters, which correspond better in this direction with those of the face; 2, the frequency of oblique or transverse positions, which, when the head falls back, evidently give rise to transverse positions of the face; 3, the frequency of *lateral* obliquities of the uterus, or partial ones of the child, if, as Gardien admits, the fœtus can be oblique independently of the womb.

§ 2. DIAGNOSIS.

[Palpation of the abdomen affords very little assistance in the diagnosis of face presentations. It will inform us, indeed, that the greater axis of the fœtus is in a longitudinal direction, and we may, perhaps, feel the head to be in relation with the pelvic opening; but how can we know whether it be flexed or extended?

The results of auscultation in face presentations are also less precise than in those of the vertex, so much so indeed that M. Depaul says it were too much to ask that it should enable us to distinguish between them. It is, however, well enough to bear in mind M. Devillier's observation, that as the face engages less easily than the vertex, the maximum intensity of the cardiac pulsations may be heard at one of those points of the abdomen where they are commonly discovered in vertex presentations with obstruction at the superior strait. It may, therefore, lead to a mistake of which it is well to be forewarned.

Having determined that the face presents, if we resort to auscultation in order to diagnose the position, the following facts should be borne in mind: When the head is so forcibly thrown back that the occiput touches the upper part of the back, the entire trunk of the fœtus inclines towards its anterior plane, whilst the vertebral column has a strong backward direction. The sternum of the child, therefore, approaches the uterine wall whilst the back recedes from it, so that the maximum of the pulsations of the heart is no longer transmitted to the stethoscope through the vertebral but through the sternal region; in a right mento-iliac position, therefore, the maximum sounds of the heart will be heard toward the right side.]

By the touch only, can the diagnosis be made with certainty. Before the membranes are ruptured, the head in general is high, and difficult of access, so that it is almost impossible to reach the presenting portion, provided the membranes are the least tense. Again, the reversion of the head not being yet completed, the forehead is the lowest part, and the one the finger encounters in performing the touch; whence, by feeling a hard, rounded body furrowed by a membranous interval (the coronal suture), we might very readily mistake it for a vertex presentation. But if the flaccid and folded membranes can be depressed without difficulty, or, still better, if they have been recently ruptured, the diagnosis becomes easier. Then we find towards one side of the pelvis a rounded, solid surface, the forehead, traversed by a suture leading to a transverse depression; next a triangular elevation whose base, looking in an opposite direction from the forehead, exhibits two openings, the nares, and beyond this, a transverse fissure bounded by the superior and inferior maxillary arches. Sometimes, the finger, when introduced into the mouth of the child, has been clearly sensible of an effort at suction. On the sides of the median protuberance, two little soft tumors (the eyes) are felt, surrounded by an osseous circle; and lastly, when the head is low down, an ear may be detected behind the pubis. When the presentation is once determined, the position is easily made out, for the opening of the nostrils must evidently look towards that part of the pelvis which corresponds with the chin. When a long time has elapsed after the rupture of the membranes, new causes of difficulty are met with. Thus, the face, which now corresponds to the open space in the pelvis, becomes the seat of a considerable tumefaction, due to the same cause which produces the tumor of the scalp in vertex presentations. The cheeks, being greatly swollen, and at the same time compressed on the sides, project, and lie close to each other in front, thus leaving a deep fissure between them, in the bottom of which the distinctive characters of the face are entirely concealed; this fissure might very readily be mistaken for the one between the nates, which are then confounded with the tumefied cheeks. Further, the lips are also swollen, wrinkled, and everted, in such a manner as to offer a rounded orifice instead of the usual transverse fissure, and this orifice has been mistaken, in some instances, for the anus; hence, in such cases, a careful examination seems to be necessary to avoid an error which, according to authors, has not unfrequently been committed.

§ 3. MECHANISM.

We shall follow the example of Nægèle, Dubois, and Lachapelle, by taking one of those varieties, in which the chin looks towards one extremity of the transverse diameter, as the type in our description of the mechanism of natural labor by the face, and shall commence with the right mento-iliac.

1. *Mechanism of Natural Labor in the right Transverse Mento-iliac Position.*—Before the membranes are ruptured, the head, as a general rule, is but moderately extended, whence the forehead is nearly always placed at the centre of the superior strait; the chin corresponding to the right, and the bregma to the left extremity of the transverse diameter. The diameters of the head hold the following relations to those of the pelvis: the mento-bregmatic corresponds to the transverse diameter of the pelvis; the bi-temporal to the antero-posterior one, and the mento-bregmatic circumference is parallel to the periphery of the superior strait; and, therefore, the pelvic axis traverses the head in the direction of the occipito-frontal diameter.

The posterior plane of the fœtus looks directly to the mother's left, and its anterior plane to her right; its right side is in front, and the left one behind.

Early in the labor, the bag of waters projects into the upper part of the excavation, to an extent proportionate to the dilatation of the orifice; and its rupture generally takes place suddenly during a contraction, with considerable noise. The rupture is followed by the escape of a large amount of amniotic fluid, and the fœtus, which was before so high as to be felt with great difficulty, descends, and renders the diagnosis more easy.

As soon as the membranes are ruptured, the mechanism of the expulsion begins, and here, as in the case of the vertex, it is composed of six stages: *i. e.*, the forced extension, the descent, the rotation, the flexion or disengagement, the external rotation, and the expulsion of the body; these comprise the movements which the head undergoes in face positions.

FIG. 79.

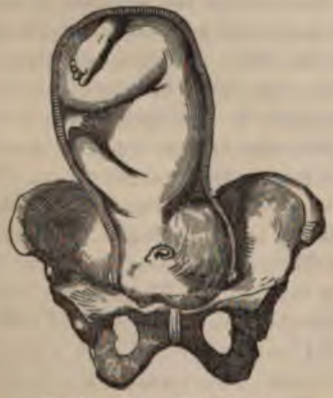


FIG. 80.

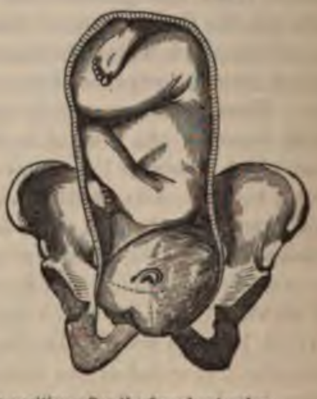


FIG. 79. The face in the right transverse mento-iliac position, after the forced extension.
FIG. 80. The face in the same position, though more fully engaged.

A. *First Stage. Forced Extension.*—The head being already moderately extended on the back, its extension will be completed during the first uterine contractions that take place after the discharge of the waters, owing to the resistance it will then meet with. This forced extension of the head changes but very little the relations of its diameters to those of the pelvis (Fig. 80); for instance, the fronto-mental has taken the place of the mento-bregmatic, and is now parallel to the transverse diameter of the strait; the bi-temporal has not changed at all; the facial, or fronto-mental circumference corresponds with the periphery of the superior strait,[1] and the pelvic axis traverses the head in the direction of a line passing from the posterior fontanelle to the child's upper lip.

B. *Second Stage. Descent.*—As soon as the head is freely extended, it engages in the excavation, and descends *as far as the length of the neck will permit.* This last sentence requires a short explanation. In the vertex positions, we have already seen that the head descended to the floor of the pelvis in such a way as to traverse all the space between the superior and inferior straits, without changing its position. But in the transverse position before us, it is clearly evident that the face can only reach the pelvic floor under one of the following conditions: that is, either the chest will engage along with the head in the excavation, or else it will remain above the superior strait; the face descending alone as far as the inferior one; that is to say, the forehead reaching the level of the left, and the chin that of the right tuber ischii; but then the neck must necessarily elongate enough to measure the whole length of the pelvis at its lateral portion, which is three inches and three-quarters. But as neither of these two conditions can be realized, the head will not be able to reach the pelvic floor; and it is for this reason that we say the face only descends *as far as the length of the neck will permit;* whereby the descent is interrupted.

C. *Third Stage. Rotation.*—The head then undergoes a movement of rotation, during which the chin rolls from right to left, so as to get behind the symphysis pubis, while the forehead rotates from left to right, and from before backwards, in order to place itself in the concavity of the sacrum. When this movement is effected, the descent becomes completed; for the shortness of the neck, or the too great extent of the ischium, formed heretofore the sole obstacle; if, therefore, by the process of rotation, the neck, which can be no further stretched, is brought into apposition with a part of the pelvic wall short enough for it to span its whole length, the descent may evidently be completed: that is, the breast still remaining above the superior strait, the chin may descend as low as the inferior one, and this is precisely what does take place; for, as the trunk participates in the rotation of the head, the neck gets behind the symphysis pubis at the same time that the chin reaches the lower edge of this symphysis, which is short enough to allow the neck to subtend its whole length.

---

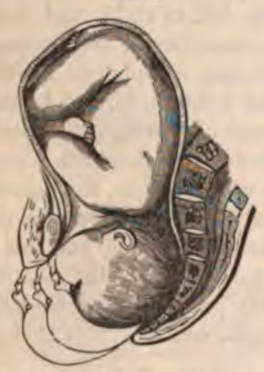
[1] M. Nægèle further supposes that the face is inclined relatively to the superior strait, and that the anterior cheek is the most dependent part, &c. The reasons upon which our objections were founded to such an inclination in the vertex presentations, oblige us also to reject it in the positions of the face, for we believe that the facial circumference is most usually *parallel to the plane*, as stated in the text.

D. *Fourth Stage. Flexion.*—The process of flexion begins as soon as the descent is achieved; indeed, we may remark that, when the chin passes behind the symphysis pubis, the forehead goes into the hollow of the sacrum, and it therefore has to traverse, in order to arrive at the inferior strait simultaneously with the chin, the whole anterior face of the sacrum, that is, about five and a quarter inches, whilst the chin only descends the length of the symphysis, or one and a half inches; in a word, this is found just in the same condition as the posterior extremity of the bi-parietal diameter in vertex presentations; and, like it, the forehead has to describe an arc of a circle around the chin as a centre. Now, this arc cannot be described without a certain degree of flexion of the head. Whence it appears that, in this transverse position of the face, *the descent is completed at the same time that the rotation is taking place, and the process of flexion beginning.*

If the relations of the diameters of the head to the inferior strait be then examined, we shall find that the same ones are concerned as at the beginning of the labor, before the complete extension had occurred; thus, the mento-bregmatic corresponds to the antero-posterior diameter, the bi-temporal to the transverse, and the axis of this strait passes through the occipito-frontal diameter: and thus it should be; since, by the commencement of flexion, the head is replaced in the state of semi-extension it had when the labor began.

The chin, under the influence of the uterine contractions, next engages beneath, and continues passing under the inferior part of the symphysis, until the fore part of the neck comes into apposition with the posterior surface of the pubis; then the upper part of the thorax engages in the cavity, and the upper portion of the back presses strongly against the occiput: the occiput is depressed, and the head thereby compelled to complete its flexion or disengagement. Of course, the perineum becomes greatly distended, and the forehead, the bregma, the vertex, and the occiput, successively appear before its anterior commissure.

FIG. 81.



Various degrees of the disengagement of the head (in the same position), the occiput departing more and more from the shoulders.

During the process of flexion, the præ-trachelo-frontal, the præ-trachelo-bregmatic, and the præ-trachelo-occipital diameters, clear in turn the antero-posterior one of the inferior strait.

E. *Fifth Stage. Restitution.*—This differs in no wise from the external rotation described by the head in the vertex presentations; for here, also, it is a consequence of the movement executed by the shoulders, in order to place themselves in the direction of the antero-posterior diameter of the strait.

[F. *Sixth Stage. Expulsion of the Body.*—This occurs as in cases of vertex presentation.]

In addition to the above, the mechanism of face labors sometimes presents a variety, which we purposely omitted for fear of interrupting the regular description; thus, we stated, that the head completed its extension and descended, but that this movement of descent was interrupted by the rotation; after which the descent was completed, and at the same time the *flexion begun.* Now all the difference rests on this last point; for in practice a considerable number of cases, more particularly of the mento-posterior positions, are met with, in which the following phenomena are observed: the second movement, or the descent, actually commences, but is checked by the shortness of the child's neck. Then a certain degree of flexion takes place *before* the rotation occurs, in consequence of which the forehead descends to the pelvic floor, and the mento-bregmatic diameter places itself anew parallel to the transverse diameter of the excavation; then the process of rotation occurs, which carries the chin behind the symphysis, and the labor terminates in the manner just indicated.

2. *Mechanism of Natural Labor in the left Transverse Mento-iliac Position.*— In this position, the expulsion of the fœtus takes place in absolutely the same manner as in the preceding case. Only the chin, as well as the anterior plane of the child, is to the left; and hence the movement of rotation occurs from left to right instead of right to left, but all the rest is precisely similar.

The same is also true of the two varieties denominated the right and the left anterior mento-iliac positions. The two other varieties (the right posterior, and the left posterior mento-sacro-iliac) exhibit an identity of mechanism in a vast majority of cases: that is to say, the head, having reached a certain depth in the excavation, then undergoes the process of rotation, which converts the position into a mento-pubic one; indeed, the necessity for this movement is far more evident here than in the mento-transverse positions, since the depth of the pelvis is much greater behind than on the sides.

It may, therefore, be laid down as a general, nay, as an almost absolute rule, that, in the face positions, whatever may have been the relations of the chin with the circumference of the superior strait at the commencement of the labor, there must be a process of rotation, whereby the chin is brought under the symphysis pubis, before the labor can terminate spontaneously. The necessity for this rotary movement may be readily understood. In order that delivery may be accomplished with the face presenting, it is absolutely necessary that the chin should reach the inferior strait; now, in the extended condition of the head, the chin cannot reach this strait, except the neck be capable of measuring the depth of that portion of the wall of the pelvis to which it corresponds. If, therefore, the symphysis pubis be the only part of the pelvis which is short enough to allow the neck to measure its depth, it becomes indispensable that the chin should be turned forward.

In the numerous varieties of this position before admitted, the mechanism of the labor only differs in the greater or the less extent of the process of rotation; an extent evidently varying according to the point with which the chin was primitively in relation to the upper strait.

Remarks.— Nevertheless, the mechanism of the face positions occasionally offers some anomalies, that require a more special notice.

1. The rotation just described, whose object is to bring the chin constantly

towards the symphysis pubis, and which has been spoken of as absolutely essential to the spontaneous termination of the labor, may not be executed. But such very rare exceptions do not in the least discredit the general principle before laid down, for they may all be referred to those instances where the dimensions of the head are small relatively to those of the pelvis; or else to those cases in which the position of the face has been spontaneously converted into one of the vertex. True, Madame Lachapelle has known the face to escape from the vulva in a transverse direction, or nearly so, in two or three instances; but she carefully adds that they were very rare exceptions.

Now, to understand this movement of rotation, it is only necessary to recall our remarks concerning the mechanism of labor; thus, it has been shown that the descent could not be completed in the transverse positions, until the chin has turned towards the pubic symphysis; and further, that when the head is extended, the resultant of the forces transmitted by the spine falls very nearly on the chin, and tends to engage it still more. Well, in this situation, the expulsive force is either perpendicular or oblique to the plane of the resistance; if the former, the uterine efforts are lost, since they do not contribute in any wise to the progress of the labor; but, if the force is oblique to the resistance, it is so either from before backwards, or from behind forwards. In the former case, it will have a tendency to carry the chin backwards; but a movement of this kind will not aid in the engagement of the chin, since the pelvic wall is much higher nearer the median line; and hence the efforts are still lost.

In the latter, on the contrary, the oblique force, by operating from behind forwards, tends to carry the chin in front: that is, towards a portion of the pelvic wall, which becomes shorter and shorter as it advances anteriorly, and thus facilitates the descent.

But, after all, what is the direction of the uterine force? Everybody knows that it changes at each instant; according to the woman's position, or the power of the contractions, the womb may be successively found in all three of the directions above indicated, relatively to the resistant plane. If it is perpendicular to that plane, the efforts are lost; or, if oblique, from before backwards, the contractions are useless; they can only be fully efficacious when acting on the chin from above downwards, and from behind forwards. But far be it from me to attribute an intelligent force to the uterus; for it is only by groping along, so to speak, that the womb finally acquires a proper direction, though, when the impulsion is once given, the force becomes more and more oblique, and consequently more active. And it is those *gropings* (excuse the term) which at times render the rotation so difficult and so tedious.

It has been asserted, of late, that the process of rotation is quite as easy in the mento-posterior as in the mento-anterior positions. Now, if I have succeeded in making my views of the cause and mechanism of this movement understood, the reader will readily comprehend that, in proportion as the chin is turned backward, and more especially if towards the right at the same time, the greater will be the difficulty of its accomplishment, since the resultant of the uterine forces becomes nearly perpendicular to the plane of resistance.

2. As regards those varieties in which the chin looks backwards, we have already stated that it is necessary this part should come round in front, though some cases of mento-posterior positions, that terminated spontaneously, are found in the books, where the chin did not get under the pubic arch; writers differ in their explanations of this anomaly. M. Velpeau takes as an illustration the mento-sacral variety, or the second position of Baudelocque, in which the chin is turned toward the anterior face of the sacrum (though we may observe, in passing, that this position is scarcely admissible); and he remarks that, as the chin does not rotate in front, the following phenomena may then take place: the forehead engages behind the body or the symphysis of the pubis, while at the same time the chin gets below the sacro-vertebral angle. The whole head descends into the excavation beyond the anterior fontanelle for the anterior plane, and the face drags after it the front surface of the neck, and even the upper part of the chest behind. The occipito-mental diameter, which still represents the axis of the strait very nearly, now begins to perform a see-saw movement from above downwards, and from behind forwards. The chin, penetrating further and further towards the bottom of the excavation, though at the same time retained by the thorax, which cannot advance, forces the sagittal suture to slip down behind the pubis, and the forehead to gain the upper part of the inferior strait. The frontal protuberances soon find a point of resistance on the perineum, and the posterior fontanelle descends in turn, and ultimately appears at the summit of the arch, when the head finally escapes from the vulva as it would in an occipito-anterior position: whence it follows, adds M. Velpeau, that the *occipito-frontal is the greatest diameter* which can present at the planes of the straits. But we cannot admit the truth of this last proposition; for if, as he says, the chin is in relation with the anterior surface of the sacrum, and it *descends* more and more, while the occiput slips behind the pubis, it is evident that the *occipito-mental* diameter must, at a given moment, traverse the antero-posterior one of the excavation. Now, as this is clearly impossible, we have to reject M. Velpeau's explanation altogether. Besides, the cases observed by Smellie and Delamotte, which he cites in support of his theory, prove nothing at all, for, in both of those instances, the fœtuses were *small and dead, and the woman had, on former occasions, been delivered of voluminous children.*

M. Guillemot has explained the spontaneous termination of the labor in these cases somewhat differently; for when the chin does not rotate in front, the labor, according to his idea, may terminate in two ways, namely: 1st. The forehead continues to descend and to engage under the branch of the pubis until the anterior fontanelle appears at the vulva, which progression permits the chin to advance forward and reach the *border of the perineum;* then the process of flexion commences, &c. But we cannot conceive how, in the forced extension of the head on the thorax, it is possible for the chin to arrive at the anterior perineal commissure by traversing the whole posterior plane of the excavation, because, from all evidence, the breast must engage extensively along with the head, which is wholly impossible, unless it be a case of abortion.

2d. The labor by the face may be converted into one by the vertex; and this always takes place, he continues, in the following manner: the face being forcibly pressed on, and unable to escape through the perineal strait, has a natural tendency to pass towards those points that offer the least resistance. Here, *this condition is found above and behind*, whence the chin leaves the perineum and approaches the fœtal chest by ascending along the hollow of the sacrum towards the sacro-vertebral angle, and the forehead following this movement corresponds to the sacrum in turn; the vertex is depressed and slips behind the pubis, and, just at the moment when the chin applies itself to the child's breast, the occiput engages under the pubic arch. He further supposes the face to be sufficiently engaged for the chin to come in contact with the perineum; but, as we have already stated, this is impossible, on account of the extent of the conjoint diameters of the head and breast, both of which would be deeply engaged in the excavation.

But, even admitting the chin should descend so low, where is the power to make it subsequently rise up in the hollow of the sacrum, the *cavity of which is occupied*, whatever M. Guillemot may say to the contrary, by the deeply engaged breast? For the uterine contraction, which is always transmitted by the spine, acts at first on the chin as a consequence of the reverted position of the head (as M. Velpeau clearly recognized), and it is only because its power is inadequate to make the latter descend any further, that its action is transferred to the other extremity of the fronto-mental diameter, that is, to the forehead, which it then depresses, according to the theory of Guillemot. Again, even supposing that the chin may remount, it is scarcely possible to believe that it gets above the sacro-vertebral angle; it must therefore constantly remain in contact with the anterior surface of the sacrum; and, consequently, at a given moment, the occipito-mental diameter must traverse the antero-posterior one of the excavation.

In my estimation, therefore, we are not to understand this as the true mode by which the mento-posterior positions of the face are converted into occipito-pubic ones; indeed, among all the cases I have been able to consult, I have only found *three* in which the chin was in direct relation with the anterior face of the sacrum, viz., those of Smellie, Delamotte, and Meza (reported by Guillemot).

Now, in the one furnished by Smellie, it is positively stated that the child was *small*, that the woman had a *large pelvis*, and that she was *usually delivered very promptly;* Delamotte says nothing about the head and the dimensions of the pelvis, in his case; and lastly, Meza was obliged to apply the forceps, in the one reported by him; so of course, that was no longer a spontaneous termination, for it would be an easy matter to demonstrate that the application of the forceps may act in an altogether different manner, and even more advantageously, than the uterine contraction in this instance; besides, the reader will not forget that, in the first two cases, the children came away dead.

All the other observations may be referred either to the right or the left mento-sacro-iliac positions; and, in these latter, it appears to me that a spontaneous termination of the labor might occur without a simultaneous engagement of the chest and head; for instance, let us suppose that the child is in a right mento-sacro-iliac position; then, after the complete extension of the head, the face will descend into the excavation as far as the length of the neck permits, and consequently the chin will reach the level of the great sciatic notch, the more so, as the form of this portion of the ilium, which is shaped like a cone, will favor the movement of downward progression. Having arrived at this notch, the chin will there encounter soft parts, which it can very readily depress, and this depression will be quite sufficient to augment the length of the oblique diameter of the excavation from a quarter to half an inch, thereby permitting the occipito-mental diameter to clear it, and the head to undergo the process of flexion, that will gradually bring the occiput under the pubic symphysis.

§ 4. Inclined or Irregular Face Presentations.

The face does not always present so regularly at the superior strait, as to have its fronto-mental circumference parallel to the opening in the pelvis, since the same causes that determine the inclination in vertex presentations, may also render those of the face irregular; and here, likewise, we may invoke the uterine obliquities, the partial obliquity of the child, or an incomplete or an exaggerated extension of its head, to explain how we sometimes find one of the cheeks, and at others the forehead or the chin, at the centre of the upper strait.

But still, these are not to be considered as distinct presentations, but rather as varieties or shades of the face presentations, which scarcely ever render the labor more difficult. In fact, the following is the only modification they are likely to cause in the mechanism of parturition; in the malar positions of Baudelocque, or those inclined towards the side, where one cheek is at the centre, the head undergoes a movement of correction whilst engaging, similar to what it does in the parietal inclinations of the vertex, whereby the face gradually regains its normal horizontal direction. In the so-called presentations of the forehead or chin, the most elevated part becomes depressed, and ultimately gains the same level as the other.

§ 5. Prognosis.

It was for a long time thought, and still is, by some persons, that a delivery by the face cannot take place by the powers of nature alone, and it is only since the labors of Boër, of Chevreul, and Madame Lachapelle, that the expulsion of the child in the face positions has been admitted to be spontaneous nearly as often as it is in the vertex positions.

Nevertheless, we must remark that, as a general rule, the labor is more tedious, more painful, and more dangerous, both to the mother and the child, and that it much oftener demands the intervention of art. Besides, the reflections above presented would naturally lead us to anticipate that the mento-posterior positions are much more unfavorable than the anterior ones. Now, this unusual delay is not because the greatest diameters of the head then present to those of the pelvis, as Capuron and many others supposed: for it is only necessary to bear in mind the relations before indicated, to understand that it is the mento-bregmatic, and the bi-temporal diameters (the one three inches, and the other three inches and three-quarters in length), which are then found to correspond with the diameters of the straits; but because the dilatation of the os uteri takes place more slowly, and because the expulsive forces, especially in the process of flexion and of disengagement, act, like the arm of a lever which is bent, nearly at a right angle. Moreover, it has already been stated that, in all other than vertex positions, a very large quantity of the amniotic liquid usually existed between the presenting part and the inferior segment of the uterus. We have also remarked (see the *Physiological Phenomena of Labor*), that this circumstance singularly influenced the rapidity of the dilatation of the os uteri. On the other hand, it is also evident that, when the chin is actually engaged under the symphysis, and the process of flexion has already commenced, the force of the contraction transmitted through the spine can only determine the successive disengagement of the forehead, the bregma, and the occiput, by describing a well-marked flexure, and, consequently, thereby losing a large proportion of its force.[1]

Certain authors, says Gardien, have incorrectly supposed that those labors in which the child presents by the forehead are more unfavorable than those where it offers by the face; for, if attention be directed to this point, the head will then he found to present in reality by its favorable diameters; and further, as M. Stoltz remarks, in the face positions, the forehead is already the lowest part, and, the more it descends when the head engages, the more easy will be the labor. Again, the chin presentations are less favorable than those of the forehead, because the child's head is then in the most perfect state of reversion, and, if the shoulders engage at the same time with the vertical diameter of the cranium, a wedging in must inevitably take place in the excavation. But even these, also, soon transform themselves into true face presentations.

As regards the fœtus, the labor, if tedious, may prove very disastrous; since apoplexy, or at least a cerebral plethora, and a disposition to convulsions, are but too often, says Madame Lachapelle, its unfortunate result. The repeated and prolonged compression of the child's neck, a compression which occurs just at the moment when the head is clearing the cervix uteri, or the superior strait, or, still more probably, when the front of the neck is placed under the symphysis pubis, satisfactorily accounts for the difficulty in the return of the venous blood, and the cerebral congestion which it occasions. Consequently, particular attention should be given to the constrained position; for a case that might be abandoned to nature, were the mother alone regarded, would require the intervention of our art, to relieve the fœtus from its painful situation. In cases of this kind, where the face had descended enough to be in full view at the vulva, Madame Lachapelle was in the habit of judging by the movements of the infant's tongue and lips; though it must not be forgotten that these motions are not constant; but, when they do exist, and are found to grow weaker, and finally to disappear, they constitute a bad sign, and claim our immediate attention. Furthermore, the child often exhibits certain peculiarities in face deliveries, which ought to be known, in order that the family may be advised of them beforehand. The face corresponds to the open space in the excavation, as also for a long time to the void under the pubic arch; and hence, it becomes affected with the ecchymosis and the sero-sanguineous infiltration before spoken of as happening in vertex presentations. Consequently, when the labor has been somewhat tedious, the infant's face at birth is nearly black, its cheeks swollen, its lips turned in, and the nose scarcely visible, and nothing frightens the parents so much as such an object, if they are not previously advised of the possibility of such an occurrence. However, this condition is generally dissipated in the course of a few days, and its resolution may be hastened by lotions composed of a little wine, or vegeto-mineral water, or brandy, freely diluted with water. No alarm need be felt about the tendency observed in the head to fall backwards, as soon as the support is withdrawn; for, it only regains the attitude it had temporarily in the pelvis. This feebleness of the muscles of the neck is evidently due to the prolonged extension they have undergone, and which has momentarily paralyzed a part of their contractile force: it ordinarily disappears in the course of two or three days.

---

[1] This is so true, that, during the process of extension, the uterine contraction is not transmitted by the spine alone; for I believe that, in certain cases at least, the thorax, by being subjected to forcible pressure, and therefore flexed on itself, just above the head, rests by its posterior-superior part directly upon the occiput, and hence may immediately transmit the uterine force to the latter, as I believed occurred in the following case. In August, 1839, I was summoned to a grocer's wife, in the *Rue du Bac*, in whom the child presented in the left transverse mento-iliac position; the membranes had been ruptured at eight o'clock in the morning; it was then five in the afternoon, and an application of the forceps had already been attempted. However, in about three-quarters of an hour after my arrival, the labor terminated spontaneously. The infant soon revived; but, in examining its head, I detected, near the posterior fontanelle, what appeared to be small splinters of bone, which crepitated under the finger, and there were also evident traces of a considerable depression on its dorsal region.

ARTICLE IV.

PRESENTATION OF THE PELVIC EXTREMITY.

We have already had occasion to state that most accoucheurs describe three distinct presentations of the pelvic extremity of the fœtus, to wit, the presentations of the breech, of the feet, and of the knees, according as the breech, the feet, or the knees, are the first to engage in the excavation and clear the external parts of generation. We have also explained why (following the example of Madame Lachapelle, Ant. Dubois, P. Dubois, and others) we consider these three as being only slight modifications of the true pelvic presentation; for modifications that do not in any wise change the mechanism of the natural labor ought certainly to be included under one and the same title.

Thus, it may happen, in presentations of the pelvic extremity, that this extremity, composed of all its elements, that is to say, of the thighs flexed on the abdomen, and the legs on the thighs, may engage in the excavation and inferior strait; or that the lower extremities, carried along when the membranes are ruptured, by the gush of the waters, may be completely or partially unfolded; the feet in the former case, and the knees in the latter, appearing first externally; or that, the inferior members being stretched out and applied to the child's anterior plane, the breech alone may descend;[1] or, lastly, that one of the lower limbs may be extended up along the abdomen, while the other remains down, and then one foot or one knee, as the case may be, will present at the vulva. We shall include all these varieties under the general name of the *presentation of the pelvic extremity;* and we again repeat that, in the presentations of this extremity, the points of departure, taken on the fœtus, are, the posterior face of the sacrum for the breech; the anterior face of the tibias for the knees; and the heels in the footling cases. With regard to the pelvis, the sacrum, or the back of the child, may be found in relation with any one of the various parts of its superior strait; but still, all these shades of position are included in two principal ones, namely, a first, or left sacro-iliac, and a second, or right sacro-iliac position; and, further, each of these exhibits its anterior, transverse, and posterior varieties.

The presentations of the pelvic extremity are less frequent than those of the vertex, though much more common than those of the face. Thus, in thirty-seven thousand eight hundred and ninety-five labors, Madame Lachapelle has noted one thousand three hundred and ninety of this class; in twenty thousand five hundred and seventeen, Madame Boivin observed six hundred and eleven; and in two thousand and twenty, M. P. Dubois met with eighty-five. In order to give an idea of the relative frequency of the cases in which the nates, the knees, or the feet are first expelled, we will add that, in those eighty-five labors, the nates appeared first at the vulva fifty-four times, and the feet twenty-six times. The presentation of the knees, so called, was not observed in a single instance. In fact, this is a very uncommon variety; for in the thirty-seven thousand eight hundred and ninety-five cases of Madame Lachapelle, the knees came down first only eleven times, or one in three thousand four hundred and forty-five.

In a sum total of sixteen thousand six hundred and fifty-four labors, Dr. Collins has observed the pelvic extremity to offer once in thirty times; and Ramsbotham, Jr., from calculations founded on twenty-seven thousand seven hundred and thirty-nine labors, and twenty-eight thousand and forty-three births, occurring at the Maternity Hospital of London, has arrived at the conclusion that breech presentations are to the others as one to thirty-five.[2] The left sacro-iliac positions are far more frequent than the right; thus, in thirteen hundred and ninety instances, the back looked towards the left side seven hundred and fifty-six times, and to the right, four hundred and ninety-four times; but thirteen times in front, and twenty-six times directly backwards (Lachapelle). In the eighty-five positions of M.

---

[1] This position of the lower extremities may be primitive: that is, it may exist before the rupture of the membranes, (indeed, according to M. P. Dubois, this most frequently occurs,) or may be consecutive to the engagement of the breech. In this latter case, the feet may have been arrested either by the periphery of the cervix uteri, or by the superior strait at the time when the breech was passing into the excavation, and hence the inferior members would be necessarily pressed up along the child's anterior plane.

[2] By a table in the revised edition, Dr. Ramsbotham furnishes a record of 35,743 deliveries that occurred between January 1st, 1828, and December 31st, 1843, in which there were 930 presentations of the breech, or lower extremities, thus showing the proportion to be 2·6 per cent, or 1 in 38·8. — *Translator.*

P. Dubois, the back was forty-one times towards the mother's left, and forty-four times to her right. As to the varieties exhibited by these two positions, the left anterior is a little more frequent than the right posterior one, but each of them is far more common than all the others put together. For instance, in one hundred and sixty-three pelvic presentations, says M. Nægèle, the back was in front and to the left one hundred and twenty-one times, whilst it was only forty times behind and to the right.

§ 1. CAUSES.

It is wholly impossible, in the present state of the science, to say why the breech should sometimes present at the superior strait; true, numerous explanations have been offered, and the following, proposed by Madame Lachapelle and reiterated by Velpeau, is perhaps the least objectionable of any. The child, they say, floats comparatively free in the uterus, until near the eighth month; then its head, during certain movements on the part of the mother, the act of lying down in particular, is carried towards the fundus uteri; and, if the infant has then acquired a considerable volume, perhaps its great occipito-coccygeal diameter cannot repass through the small diameters of the uterine ovoid, without undergoing as forcible a movement as that which changed its position; and if this latter does not occur, the fœtus will retain its new attitude, and at the time of the labor the pelvic extremity will present at the passage. This explanation, I repeat, although liable to many objections, still appears the most probable.

§ 2. DIAGNOSIS.

[Breech presentations may be recognized by the successive employment of palpation, auscultation, and the touch.

Palpation, in accordance with the rules given, will enable us to feel the head at the upper part of the uterus; and, if it can be clearly made out, leaves little doubt as regards the diagnosis. If, however, the walls of the abdomen be thick, or those of the uterus rigid, the cephalic and pelvic extremities may be mistaken for each other, especially if we should happen to feel the latter by its posterior or sacral surface. But moderate importance ought, therefore, to be attached to this kind of exploration, though it is nevertheless true that it has its advantages. We remember a case in which both auscultation and the touch seemed to indicate a vertex presentation, whilst palpation enabled us to feel the head at the fundus of the uterus, and the child was born by the breech.

Auscultation may also enable us to recognize breech presentations, for in this case the dorsal region of the fœtus is pretty high up, and, in consequence, the maximum of the pulsations of the heart are higher than in head presentations. The loudest sound will generally be heard on or above a horizontal line passing through the umbilicus, and the side of the abdomen at which it is perceived will also indicate the point toward which the back is directed. The diagnoses of both presentation and position are thus made at the same time.]

To the foregoing signs may be added the following as distinguishable during labor. The bag of waters is very large, and projects considerably into the upper part of the vagina; sometimes assuming the form of an elongated tumor,[1] which may descend, even to within a short distance of the vulva.

---

[1] Certain writers have evidently been in error in giving this particular form of the amniotic sac as a positive sign of a presentation of the pelvic extremity, since it may

When the membranes are ruptured, a very considerable quantity of water escapes, for the presenting part fills up the neck but very imperfectly, and hence, all the amniotic liquid flows out; and if the rupture should occur during a strong pain, it would probably be accompanied by a loud report.

Stein described the uterine orifice as being oval after the rupture, and Madame Lachapelle confirmed this sign; but I must confess that I have found great difficulty in verifying it.

A momentary suspension or a diminution of the pains often results from a too copious or a too rapid discharge of the waters; and, further, a flow of meconium most generally takes place soon after the membranes give way.[1]

But the only characteristic signs are those furnished by the touch; and they will vary with the presenting part. Therefore, although we have included, so far as the mechanism is concerned, all the cases in which either the nates, the feet, or the knees present, under one general term; yet, in the diagnosis, we must carefully distinguish them from each other.

1. When the breech alone presents, the finger first encounters a soft, rounded tumor, upon some portion of whose anterior surface a hard, resistant part, formed by the great trochanter of the thigh-bone, is detected. Thus far, it might be mistaken for a vertex presentation; but if the finger be next carried upwards and backwards, so as to reach, as it were, the sagittal suture, it will penetrate into the fissure between the nates, at the bottom of which the most important diagnostic signs are discovered; for the point of the coccyx is felt towards one side, surmounted by an irregular osseous surface, constituted by the posterior face of the sacrum; then the anus, a small, rounded, and wrinkled orifice, into which the finger cannot be introduced without resorting to considerable force, whatever authors may say to the contrary; lastly, the external genital organs can be easily distinguished, and thereby the sex of the child may be announced in advance.[2]

The prominence of the coccyx is not only a certain sign of the presentation, but it may also serve to determine the position; because its point is always directed towards the side not corresponding with the child's back.

---

be met with in other cases. I have twice observed it myself in clear vertex presentations that were engaged, even then, as far as the middle of the excavation. I can only explain this last circumstance by supposing an extreme laxity of the membranes.

[1] However, a discharge of meconium may take place in other than pelvic presentations; but then it is an alarming sign, and one that should receive the accoucheur's immediate attention. In fact, it always indicates the death, or at least a suffering condition, of the child; and, therefore, will most generally require the intervention of art, since it is particularly apt to come on when the labor has continued a long time after the rupture, and the fœtus is suffering from the protracted delay; or possibly it may announce the compression of the umbilical cord (see *Prolapsus of the Cord*).

[2] The accoucheur ought to be exceedingly careful not to deceive himself on this point; and, in case of any doubt, it would be much better to abstain from all predictions, than to expose himself to an error that would most certainly be retorted upon him afterwards. It is also prudent, where the child is ascertained, by the touch, to be of a sex different from what the family, and more especially from what the mother desires, not to communicate the result of his diagnosis, lest the disappointment she would experience might, like any other acute moral emotion, exercise an unfavorable influence over the progress of her labor.

2. Where the two feet present together in the vagina, it is impossible to confound them with any other part, and the direction of the heels then clearly indicates the child's position. But where a single foot only is detected, and that very high up, it might be mistaken for a hand. However, a little attention will serve to distinguish them; thus the toes are arranged in the same line, are shorter, and less movable; while the fingers are longer and the thumbs separated from the others; the internal border of the foot is much thicker than the external; but the two margins of the hand are very nearly of the same thickness; again, the foot articulates with the leg at a right angle, while the hand continues out the line of the arm.

The diagnosis is very difficult when the feet present along with the nates, and they alone are accessible. Sometimes even only one foot can be felt, which renders the case still more obscure; then we have first to ascertain which is the foot touched; though, for that purpose, it is only necessary to pay attention to the relation existing between its internal border and the heel. For instance, let us suppose that the latter is turned towards the symphysis pubis, and its internal border to the right side of the mother; this is evidently the right foot; if, on the contrary, the heel be directed towards the sacro-vertebral angle, and the internal border to the right, this would be the left foot, &c.; now, the right foot being once distinguished from the left, it only remains to determine towards what part of the superior strait the points of the toes are directed (bearing in mind that we always suppose the inferior extremities to be flexed on the abdomen, and the feet crossed and turned inward). In this position of the child, if the toes of the right foot are turned towards any point of the anterior half of the pelvis, the back will be directed to some part of the left lateral half; but if the toes on the left foot point towards the anterior part of the pelvis, the child's back will look to some point on the right lateral half, and *vice versâ.*

[We think the following the easiest way of distinguishing the right foot from the left one: First, make sure of the position of the toes, heel, and inner edge of the foot in question. Then let the observer imagine his own foot in precisely the same position, with the heel, inner edge, and toes superposed, as it were, upon it. Should his right foot correspond, he will diagnose a right foot, but a left one, should it require the left foot to satisfy the conditions.]

3. The knees very rarely present first; besides, they have such well-marked characteristics in their form, their roundness, their hardness, the size of the limbs attached, and the fold of the ham which surmounts them, a fold presenting a transverse concavity instead of the convexity exhibited at the elbow and instep, that we consider it useless to dilate further upon their diagnosis.

§ 3. MECHANISM.

As the left anterior and the right posterior are the most frequent of the three varieties admitted for both the left and the right sacro-iliac positions, we shall select them as the type of our description.

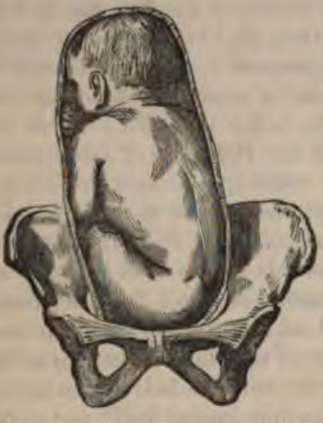
1. *Mechanism of Natural Labor in the Left Anterior Sacro-iliac Position.* (The first, of authors.)

Before the rupture of the membranes, all the parts of the child are folded up along its anterior plane; the head is slightly flexed on the chest, the arms are applied to the sides of the thorax, the fore-arms are bent on the breast, and the inferior members flexed on the front of the abdomen. In the position before us, the back of the fœtus looks forward and to the mother's left; its anterior plane behind and to her right; its left side is in front and to the right, and the right side behind and towards the left; the greater or bis-iliac diameter of its hips corresponds to the right oblique, and its sacro-pubic or antero-posterior one to the left oblique diameter.

[A. *First Stage. Moulding of the Breech.*—The first effect of the contractions is to curve the fœtus upon its anterior plane, and compress the lower extremities upon the breech, so as to mould these parts into a mass small enough to engage in the cavity of the pelvis. The pressure really lessens the size of the breech, and, at the same time, adapts it better to the opening of the superior strait. Although the diminution of bulk is greatest after the membranes are ruptured, the escape of the waters is also liable to be accompanied by an extension of the lower limbs, giving rise to the varieties known as foot and knee presentations, the only effect, however, being to facilitate the descent.

This stage is analogous to the first one in vertex presentations; only the diminution of size, in this case, is real and sufficient to allow the breech to descend into the pelvis, whilst in vertex presentations, the slightly compressible head is only enabled to do so by a sort of mechanical artifice, whereby the act of flexion causes it to present the diameters most favorable to its engagement.]

FIG. 82.



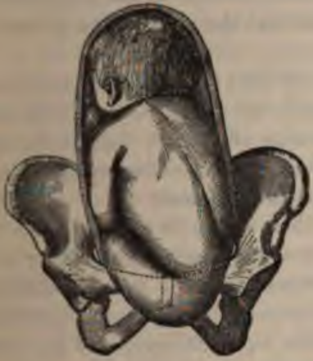
The presentation of the breech in the left anterior sacro-iliac position.

B. *Second Stage. Engagement.*—If the os uteri be freely dilated when the rupture takes place, the nates immediately engage by traversing the cervix, and descend rapidly into the excavation; though, in the contrary case, they remain high up for a long time. In proportion as the contractions acquire more force and energy, the buttocks gradually descend; the left sliding on the internal surface of the obturator foramen and the obturator internus muscle, and the right along in front of the parts that are situated in the left posterior quarter of the pelvis.

C. *Third Stage. Rotation of the Breech.*—Having arrived at the inferior strait, the child's pelvis undergoes a movement of rotation that carries the left hip behind the right ischio-pubic ramus, and the right hip in front of the inner half of the sacro-sciatic ligament. The left or anterior hip next engages under the aforesaid ramus, and is the first to show itself through the vulva; but it is generally the right or posterior hip, which, advancing step by step, and describing an arc of a circle around the anterior one as a centre, and traversing the whole anterior surface of the perineum, first succeeds in disengaging itself at the anterior commissure, while the other remains nearly immovable at the summit of the arch. During the delivery of the breech, the body of the child, by becoming strongly engaged in the excavation, is flexed laterally on its anterior (left) side in such a way as to accommodate itself to the curvature of the pelvis. (Fig. 84.)

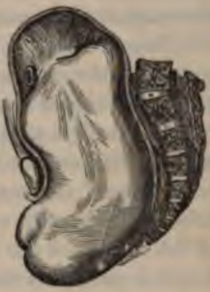
D. *Fourth Stage. Disengagement of the Breech.*—As the right buttock approaches the posterior commissure of the labia externa, and engages in this opening, the breech, or rather the bis-iliac line of the fœtus, which had already cleared the lower strait in a somewhat diagonal position, now assumes an exactly antero-posterior direction, so as to correspond with that of the longitudinal diameter of the vulva. However, this is not constant, as the breech sometimes retains its diagonal position throughout; the thighs closely applied on the belly already begin to appear, and, pending the disengagement, the fœtal trunk, by accommodating itself, as above stated, to the direction of the pelvic axis, is strongly flexed on its anterior (left) side. The rotation executed by the hips, when they reach the inferior strait, may either be a partial movement, or else one in which the whole trunk participates.

FIG. 83.



The same position after the internal rotation is accomplished.

FIG. 84.



The delivery of the breech.

In the former case, it can only take place by the aid of a certain degree of torsion in the lumbar vertebral column, and then the pelvis, immediately after its delivery, undergoes the process of restitution, whereby it once more regains its primitive diagonal position.

As soon as the hips are clear, the breast engages in the excavation, the arms always remaining applied against the anterior lateral parts of the thorax, and the shoulders soon arrive at the inferior strait in an oblique position, supposing they have not previously participated in the rotation performed by the pelvis of the child.

The shoulders observe the same mechanism in disengaging as the hips; that is, they turn in such a manner as to place the anterior one, here the left, behind the right ischio-pubic ramus, and the posterior one just in advance of the left sacro-sciatic ligament, whence they both clear this strait diagonally; but when this is passed, and there is no other resistance than that of the soft parts to overcome, they complete the rotation and become placed, the one directly in front, the other behind. As to the other parts, the sub-pubic shoulder and elbow are the first to appear externally; but it is still the posterior ones that are first delivered.[1]

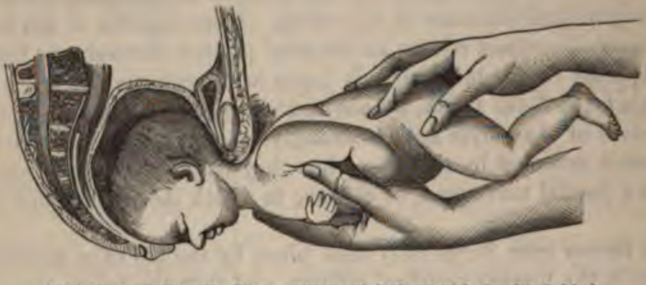
Prof. Dubois contends that, in breech deliveries, the anterior hip and the front shoulder, in the disengagement of the upper part of the trunk, are expelled before the corresponding part in the rear; but I may be permitted to repeat again, that, although matters often do occur in the way described by the professor, still it has seemed to me that the view above given holds true in the majority of cases.

E. *Fifth Stage. Rotation of the Head.*—Whilst the shoulders are traversing the pelvis in the manner just indicated, the head, being flexed on the breast, clears the upper strait in the direction of its left oblique diameter; that is, the forehead is turned towards the right sacro-iliac symphysis, and it retains that position until it reaches the inferior strait.

The diameters of the head, which are then found in relation with those of the inferior strait, will necessarily vary according to the greater or less degree of the flexion of the head. For instance, when it is only moderately flexed, which is generally the case, the occipito-frontal diameter corresponds to the left oblique one, the bi-parietal to the right oblique, and the axis of the inferior strait traverses the head very nearly in the direction of its trachelo-bregmatic diameter.

If we suppose the head to be more strongly flexed on the chest, the sub-occipito-bregmatic diameter takes the place of the occipito-frontal, and the occipito-mental corresponds very nearly to the axis of the inferior strait. In a word, we find the same relations as in a vertex presentation, only the head presents by its base instead of its summit.

FIG. 85.



Delivery by the breech. Disengagement of the head with the chin behind.

It then performs a movement of rotation, whereby the face is carried into the hollow of the sacrum, while the occiput gets *behind*, and the neck under the symphysis pubis; whence the sub-occipito-bregmatic diameter approaches the antero-posterior one very closely, still retaining, however, a certain obliquity.

F. *Sixth Stage. Expulsion of the Head.*—At that time, the womb can act but very feebly on the head (see *Prognosis*), which is altogether down in the vagina, or nearly so; but the tenesmus, says Velpeau, occasioned by its pressure on the rectum and the bladder, constrains the woman to collect all her powers, and to redouble her courage, and then the contractions of the abdominal muscles soon come to the aid of the powerless womb; these forces, acting conjointly, flex the head more and more, and whilst this process of flexion is going on around the neck or the sub-occipital region as a centre, the chin, the forehead, the bregma, and occiput will be found to appear successively in front of the anterior commissure of the perineum.

---

[1] Many books, on the subject of shoulder-delivery, assert that the arms are retained by the borders of the excavation, and thereby get up alongside of the head; though,

During the flexion, the head represents a lever of the first kind, whose power is at the occiput, the fulcrum at the sub-occipital point, or that portion of the neck situated under the arch, and the resistance at the chin, or rather at the forehead, which, being arrested by the perineum, must distend the latter and render it thinner. Hence, if radii be drawn from the sub-occipital point of the head, situated beneath the symphysis, as a centre, and terminating at the median line of the face and vault of the cranium, those radii will exactly represent the diameters which successively clear the antero-posterior one of the inferior strait; the principal of which are the sub-occipito-mental, the sub-occipito-frontal, and the sub-occipito-bregmatic.

2. *Mechanism of Natural Labor in the Right Posterior Sacro-iliac Position.* (Fourth of Baudelocque and third of Capuron.)—In this position, the child's sacrum is turned towards the right sacro-iliac symphysis, its back is behind and to the mother's right, and its anterior plane is to the left, in front; the right side looks forward and to the mother's right, while the left side is behind and towards her left; and the great or bis-iliac diameter of the child's pelvis corresponds to the right oblique diameter.

[Here also the mechanism of the labor may be divided into six stages analogous to those just described for the left sacro-iliac position,—to which the reader is referred in order to avoid repetition.]

Let us suppose, when the membranes are ruptured, that the lower extremities, swept along by the gush of liquid, are completely unfolded, and that the feet present first at the vulva. In this case, the limbs are soon delivered, under the influence of the uterine contractions, without offering any peculiarity, and the hips easily reach the inferior strait, where they engage, sometimes preserving their primitive diagonal position, while at others the anterior one gets slightly in advance towards the symphysis pubis, and the other or posterior goes behind to the median line of the sacrum.

The arms and shoulders present in turn, and their disengagement is nearly the same as in the preceding case.

After the delivery of the shoulders, the head alone remains in the excavation, and its expulsion may take place in several different ways; sometimes, indeed, the occiput remains posteriorly throughout the whole delivery,

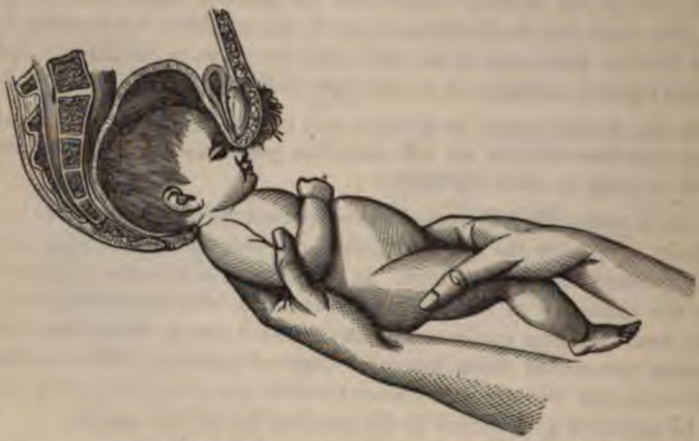
as Desormeaux very justly remarked, this scarcely ever happens when the delivery is left entirely to nature, and no traction whatever is made on the pelvic extremity; consequently, when the labor progresses regularly, the accoucheur should overcome the temptation to aid nature a little by drawing on the parts, for such imprudent traction must certainly straighten out the arms, since there is no counteracting power in these cases to press them outwardly; for, being retained by the friction, they remain above the excavation, and the head descends between them, rather than that they mount up on its lateral parts: and fortunate indeed will it be if extension of the head is not produced by these tractions!

though at others, and indeed in the great majority of cases, it comes round in front so as to place itself behind the symphysis pubis.

A. *The Occiput comes in Front.*—This conversion may begin as soon as the hips have cleared the inferior strait; thus it often happens, as before stated, that the whole fœtal trunk participates in the rotation of the haunches, whence the posterior plane of the child, which was primitively situated behind, is brought in front by describing a kind of a spiral, that commences in the hips and terminates at the occiput. The head also has participated in the rotation of the trunk, so that, when the former descends into the excavation, the occiput becomes placed behind the symphysis pubis.

But when the occiput retains its posterior position, after the delivery of the trunk, this rotation of the head may even take place in the pelvis or at the inferior strait. In such cases, after the shoulders are born, the back of the child resumes its posterior direction by a sort of restitution, and the head, remaining alone in the excavation, becomes placed in the direction of the left oblique diameter, the occiput being behind and to the right, and the forehead or bregma towards the mother's left, in front. It then performs a movement of rotation, by which the occiput, after having traversed the whole right lateral half from behind forwards, locates itself behind the symphysis, and the forehead, by rolling from front to rear, is carried into the hollow of the sacrum. . . . . Though, whatever may have been the mode by which this mutation is effected, the labor terminates, just as in the preceding case, as soon as the occiput gets behind the pubic symphysis.

FIG. 86.

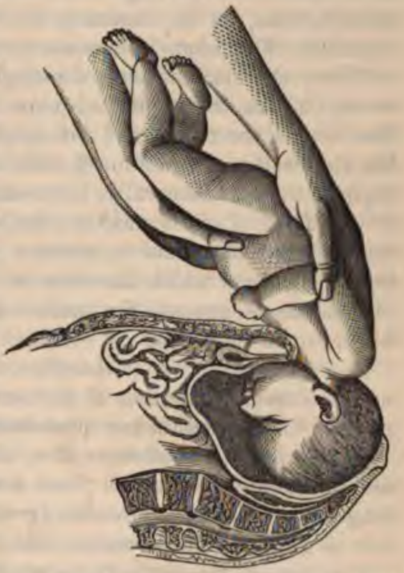


Delivery by the breech; disengagement of the head. The chin sliding beneath the pubis, the occiput remaining behind.

B. *The Occiput remains behind.*—When the occiput remains behind until the end of labor, the delivery of the head may take place in two ways: thus, in the majority of cases, this part engages in the excavation in a state of flexion, where it soon undergoes a very slight movement of rotation, which carries the occiput towards the concavity of the sacrum, and the forehead or bregma behind the symphysis pubis; then, as the uterine contractions and the abdominal muscles force the head to become more and more flexed, the following parts are found to appear in succession below the symphysis and through the vulva; first the whole face, then the forehead, the bregma, the vertex, and last of all the occiput. The head is therefore delivered by a process of flexion, having the neck, as a centre, resting against the anterior commissure of the perineum. (Fig. 86.)

Finally, it may happen that, instead of remaining applied on the chest, the chin is arrested, and continues above the pubis, while the occiput is carried more and more backwards by a well-marked movement of extension. The head engages in the strait by its occipital extremity, which then traverses the whole posterior part of the excavation by a see-saw movement, and is born first at the perineal commissure; after it come, successively, the vertex, the anterior fontanelle, the forehead, and the entire face. Consequently, the head disengages by a process of extension, having the prætracheloid region as a centre, which is placed at first behind, and then under the symphysis pubis. Cases of this kind are reported by Leroux, Michaelis, and Asdrubali, but they are very rare (FIG. 87).—*The mechanism of labor* in the left transverse, and in the right anterior, and right transverse sacro-iliac positions, is analogous to that just described for the left anterior, and of the right posterior iliac position.

FIG. 87.



Delivery by the breech; the occiput behind, and disengaging at the posterior commissure of the vulva, whilst the chin remains behind the pubis.

[We would observe, however, that the left hip, which in all left sacro-iliac positions ought to appear under the arch of the pubis, turns from right to left in the left anterior sacro-iliac position, and from left to right in the left posterior sacro-iliac-position. The right hip will, in like manner, be found to disengage the first in the right sacro-iliac-position, by turning from left to right in the anterior variety and from right to left in the posterior one.]

§ 4. PROGNOSIS.

Breech presentations are not, usually, much more dangerous than those of the head; still, in order to arrive at an intelligent prognosis, the labor should be studied in reference to its effect upon the mother and upon the child respectively. Though, from the manner of its expulsion alone, the life of the child is seriously endangered, the parturition is certainly less exhausting and less painful for the mother.

1. *As regards the Mother.*—As a whole, the labor is somewhat longer in breech presentations; though, fortunately, the delay is experienced almost exclusively during the first stage, and is the cause of but little additional suffering to the mother. The slowness of the process of dilatation is readily explained by the conditions which have been already pointed out. Before

the membranes are ruptured, the presenting part, having neither the form, roundness, nor regularity of the top of the head, cannot adapt itself to the regular concavity of the inferior segment of the uterus, and being separated from the neck by a considerable amount of amniotic fluid, is therefore incapable of hastening its dilatation. Should the membranes happen to rupture long before the dilatation is completed, the size or irregularity of the breech prevents its engaging readily, and the neck, not being supported as it is by the top of the head in vertex presentations, collapses, and contracts, so to speak, the opening which it had just before presented. In cephalic presentations, on the contrary, the head engages like a wedge, and each expulsive effort tends to increase the dilatation.

When the neck is once thoroughly dilated, the expulsion has always seemed to me to be effected more rapidly than in vertex presentations. The breech, the trunk, and the shoulders are generally delivered with ease, but the head sometimes meets with obstruction, and may be arrested at the superior strait. Generally, however, it is detained for but a short time; for if the efforts of the female are not capable of expelling it, it becomes the duty of the accoucheur to interfere promptly, in order to remove the child from the danger which threatens it. The course to be pursued under these circumstances, exposes the mother to no danger whatever, the entire risk falling upon the fœtus.

As regards the mother, therefore, the breech presentation is perhaps even more favorable than that of the vertex; I would add, that it is certainly more so for her than a face presentation.

It is important to observe, that all the varieties of breech presentation are not equally favorable. Some authors think that the labor is usually longer when the fœtus presents by the breech than when the feet are the first to descend into the excavation.

The size of the parts that constitute the pelvic extremity, it has been said, do not permit it to engage so readily; and hence, the uterine contractions must operate a longer time in order to adapt those parts to the diameter of the pelvis. This is true; but, as Madame Lachapelle has observed, their softness is such that, when once engaged, they easily conform to the passage; and besides, as M. P. Dubois declares, the greater their volume is, the more will the labor resemble that of the vertex presentations. Consequently, the professor teaches, contrary to the opinion generally adopted, that a delivery by the breech is far preferable to that in which the feet come down first: the truth of which proposition will be better understood when we shall have pointed out the inconveniences attending this latter circumstance.

As the footling presentation does not exhibit the same unfavorable appearances in respect to volume, it is preferred by some persons; for then the fœtus, presenting by its smallest extremity, will, in their estimation, be more easily expelled, since the dilatation of the parts, from being slow and gradual, will be much shorter and less painful. If you wish, they say, to drive a cork into the neck of a bottle, you would present its smallest extremity, and then it would enter more readily, and the same is true of the child in the foot presentations; for the fœtal ovoid may be considered as a cone, whose base is at the cephalic, and whose summit is at the pelvic extremity. In the case of the bottle this is true, but only so, because the efforts you use to make it penetrate, will be redoubled as the larger extremity approaches the neck of the bottle; that is, the force will increase with the difficulties to be overcome; but this last condition does not hold good in the delivery by the feet. Because, as the inferior parts of the child become successively disengaged, there is less left remaining in the uterine cavity, and there is even a period when the head, having reached the excavation, is almost entirely out of the cavity of the cervix; but the uterus, during its evacuation, retracts, and, like all contractile muscles, loses a great portion of its power by this retraction; and it is therefore just at the moment when the great extremity of the cone, represented by the fœtus, has to overcome the resistance of the soft parts, that the uterine contractions are the most enfeebled, and often, indeed, they cannot aid at all in the expulsion of the fœtal head: consequently, the powers here diminish in an inverse ratio to the obstacles in the delivery. If the reader now recalls what takes place in vertex presentations, he will readily comprehend the difference between the two; no doubt, the largest part of the child then presents the first, and its expulsion requires violent and long-continued efforts; but remark that, up to the moment when the head clears the vulva, the uterus yet contains in its cavity a considerable quantity of amniotic liquid, and also the largest part of the fœtal trunk; wherefore, it is still sufficiently distended not to have lost its power of contracting, a power that can be exercised over a large surface, and upon which it is forcibly applied until the end of labor. Again, the head having once reached the exterior, the parts which have been freely dilated by its passage offer but a feeble resistance to the expulsion of the trunk and lower extremities; and hence, the retraction of the womb may diminish its expulsive forces without this diminution having any unfavorable influence over the termination of the labor.

2. *As regards the Child.*—The delivery by the pelvic extremity is very dangerous to the child; thus, the statistical results furnished by Madame Lachapelle prove that, in eight hundred and four presentations of this class, one hundred and two children are born feeble, and one hundred and fifteen are still-born: the proportion of deaths to the whole being rather more than one-seventh; whilst, in twenty-six thousand six hundred and ninety-eight vertex positions, there were only six hundred and sixty-eight still-born children, which gives one in thirty, or about one-thirtieth. As to the particular prognosis in each of the three varieties of this presentation, it has been remarked that, when the buttocks advance first, the number of deaths is about one in eight and a half, or a little less than an eighth; for footling presentations, one in six and a half, rather less than one-sixth; and for the knees, one in four and a half, or not quite one-fourth. But M. P. Dubois has justly remarked that this proportion is not perfectly correct, since all the children born by the pelvic extremity are included in the registers of the Maternity, without making any allowance for circumstances foreign to the position, but which nevertheless may have produced the child's death. Therefore, by laying aside all the cases where the children seemed to have been lost under the influence of causes that evidently did not attach to the presentation itself, he has arrived at the conclusion that, in delivery by the pelvic extremity, about one child in eleven dies;

whilst in vertex presentations, only one in every fifty proved fatal. The difference still, as here shown, is frightful.

Other things being equal, the labor is much more dangerous for the fœtus in primiparæ, than in those who have previously borne children; because the resistance of the perineum which is sometimes sufficient in the former to arrest the labor, even in vertex presentations, has here a still greater tendency to arrest the head, the uterine contractions, as just demonstrated, being weaker.

But what is the cause of the child's death? For a long time it was supposed that, when the fœtus presented its smallest extremity, each part, as it came down, being more voluminous than the one which preceded it, had to overcome new resistances; that it underwent, in consequence, a certain amount of compression, and this compression, being exercised from below upwards, would necessarily drive back the fluids, and thus give rise to a cerebral congestion, the anatomical signs of which are detected at the autopsy of the little corpse. But this supposed pressing back of the fluids is altogether inadmissible: 1st. Because the uterine neck is alternately in a state of relaxation and constriction, whilst such an explanation would require it to be permanently contracted; 2d. Because, however great the contraction, it would not be sufficient to compress the large vessels situated deep in the extremities, and in the centre of the great cavities; 3d. Besides, by recalling what takes place in the vertex and face presentations, we shall see that it is not in the parts which are still contained in, and compressed by, the uterine cavity, that a more considerable afflux of fluid would be likely to occur, but rather in those which, from being already free, are thereby relieved from all further compression. We think this mortal congestion can be explained in a much more satisfactory manner by a compression of the cord; for, after the breech is disengaged, the cord is stretched from the umbilicus to its placental insertion, and is placed, both in the excavation and uterine cavity, between the pelvic wall and the trunk, or even, a little later, betwixt this wall and the child's head. Hence, we can easily understand how liable it is to be compressed; and as the delivery of the upper parts, and more especially of the head, often takes place with difficulty, how this pressure may exist for a long time, and thus necessarily interrupt the circulation in the cord. Indeed, it is now generally admitted that the placenta is the seat of the child's respiration; or, rather, that the blood of the fœtus comes there directly into contact with that of the mother, whereby it experiences certain modifications closely analogous to those which the blood of the adult undergoes in the lungs, by its contact with the atmospheric air; the circulation being interrupted in the cord, the fœtus then finds itself in the condition of an adult deprived of respirable air, and it dies asphyxiated; now it is well known that cerebral congestion is one of the most constant anatomical phenomena of this state.[1] I am of the opinion that asphyxia of the fœtus might take place in still another manner, and yet without the cord being necessarily compressed. It was stated above, that, when the head gets down into the excavation, no portion of the child is left in the uterine cavity, and the empty womb then retracts of its own accord; which retraction determines, as is well known, the separation of the placenta, whereby the utero-placental vessels are inevitably torn, and the fœtus placed in the same condition as if the cord was compressed, and, should the expulsion of the head be at all delayed, it might die asphyxiated.

---

[1] Most of the older writers have explained the child's death somewhat differently, in these cases; thus, according to some, the pressure interrupts the circulation in the umbilical arteries, but leaves the calibre of the vein entirely free, whence the fœtus continues to receive blood through the latter, without being able to send it back again by the former; and it then dies from a superabundance of this fluid, from apoplexy. Others, on the contrary, supposed that the stricture acted more particularly upon the vein, leaving the arteries free, and therefore that the infant died of anæmia or syncope.

It is not necessary, however, that the placenta should be separated in order to produce this effect; for, as Van-Huevel remarks, if the head be retained for some time in the cavity of the pelvis, the retraction of the womb would of itself obstruct, or even stop the utero-placental circulation, and destroy the fœtus by asphyxia.

ARTICLE V.

PRESENTATION OF THE TRUNK.

At the commencement of this chapter, we gave the reasons that induced us, like Madame Lachapelle, Nægèle, and Dubois, to admit but two presentations for the trunk, and therefore shall not now repeat them; for, doubtless, the reader will bear in mind that all the varieties of the trunk presentations may be referred to the two following, namely, one of the right and one of the left lateral plane.

When the former presents at the superior strait, the child's head, which, in these cases, is taken as the point of recognition, may be found placed over some portion of the left lateral half of the pelvis, and this constitutes the first position of the right lateral plane (or of the right shoulder, Lachapelle); or, the head may be situated over some point of the right lateral half, and this is the second position. We have, therefore, two positions of the right shoulder, or right lateral plane; and, in the same way, there are two for the left shoulder, or left lateral plane; in the one, the head is to the mother's left (the left cephalo-iliac), and in the other it is at her right (the right cephalo-iliac).

It is a very common circumstance in trunk presentations, to find the arm and hand hanging down in the vagina, or even the latter appearing at the vulva. This, although regarded for a long while as a much more serious affair than a proper shoulder presentation, should be considered as very nearly similar in its character to the deflexion of the lower extremities in certain cases of pelvic presentation; the older accoucheurs have therefore erred in describing it as a distinct variety, under the title of the presentation of the arm and hand, it being merely an additional phenomenon associated with the presentation of the child's lateral region, and scarcely deserving consideration as a variety of these positions; we shall see, further on, wherein they were mistaken on this point of doctrine.

Neither of these theories will bear the slightest examination, since it is all-sufficient to examine the cord, and the intertwining of its vessels, to be convinced that this partial compression cannot exist, except under peculiar circumstances; that such pressure must interrupt the circulation, both in the arteries and veins, and that it neither augments nor diminishes the quantity of the child's blood. Death by asphyxia, therefore, is the only possible mode.

The trunk presentations are comparatively rare, being a little less so, however, than those of the face; thus, Madame Lachapelle met with sixty-eight cases in fifteen thousand six hundred and-fifty two labors, or one in about two hundred and thirty; and, in the two thousand two hundred deliveries reported by M. P. Dubois, there were thirteen trunk presentations. Dr. Bland observed it in the proportion of one to two hundred and ten; Dr. Joseph Clark, one in two hundred and twelve; Merriman, one in two hundred and fifty-five, in his private practice; M. Nægèle, one in one hundred and eighty; and Dr. Collins, one in four hundred and sixteen.

As to the relative frequency of the presentations and positions, it would appear, from the statistical tables of Madame Lachapelle, that the right shoulder, or the right lateral plane, presents a little more frequently than the left; and that the dorso-anterior positions, that is, the first one of the right shoulder, and the second of the left, in which the back corresponds to the anterior part of the uterus, are more frequent than the dorso-posterior positions, or the first one of the left and the second one of the right shoulder, where the child's back is directed towards the mother's loins. (Nægèle.)

§ 1. CAUSES.

We have but little to say concerning the cause of trunk presentations, excepting that the smallness and mobility of the child, a rounded form of the uterus produced by a large amount of amniotic fluid, obliquity of the womb, or of the straits of the pelvis, and distortions of the superior strait, are generally regarded as predisposing thereto. We can readily understand that, in the latter case, the contraction of the pelvic entrance might render the engagement of the head impossible, and by causing it to glide toward one of the iliac fossæ, favor a presentation of the shoulder. The insertion of the placenta upon the neck of the uterus, also, seems to predispose to presentations of the trunk, inasmuch as out of ninety cases of this character, there were twenty-one in which the shoulder presented. M. Danyau thinks that a more plausible explanation may be found in the shape of the uterus, whose transverse diameters he supposes to be greater under those circumstances than usual. In support of his view, he alleges the following case of Dr. Lecluyse. A woman had her children to present the shoulder in three successive labors, and on the third occasion, the latter physician discovered that the womb, so far from being pyriform in the vertical direction, was shaped, so to speak, like an ellipsoid, whose major axis was transverse, whilst the fundus of the organ was but slightly elevated above the pubis.

The same explanation was proposed long ago by Wigand. How is it possible, says he, for a well-formed child, whose body represents an oval, to assume, without being compressed or incommoded, an oblique or transverse position, in a womb of an ovoid shape? Supposing that, impelled by certain causes, it should assume these defective positions for a moment, what magical power could keep there a fœtus, whose mobility is so highly favored both by the fluid in which it swims, and the polish of the internal surface of the ovum? What is there to prevent it, in obedience to physical laws, from changing its inconvenient position by bringing its long diameter to coincide with the longitudinal one of the uterus? No better reply, he adds, can be given to these questions, than by admitting that these defective positions are due to an irregular shape of the womb, rather than to the movements which it may have performed.

Remembering the unfortunate perseverance with which defective positions recur in the cases of certain females, there is a strong disposition to seek for the cause in a peculiar shape of the uterus; and had a peculiar conformation of the organ been discovered before the first gestation, it might, perhaps, be admitted, that notwithstanding the development undergone during pregnancy, the irregularity of shape would be preserved.

Still, we may be allowed to ask whether the increase in size transversely, near the end of gestation and at the beginning of labor, may not be the effect rather than the cause of the unfavorable position of the fœtus.

As to the determining causes, the only ones recognizable are fortuitous and accidental; thus, any violent commotion, any trifling shocks, kept up for a long time, such as those produced by carriage riding, or by exercise on horseback, the perturbation from the upsetting of a coach, and even sudden fright, may change, according to authors, the child's position in certain cases, and convert spontaneously a vertex presentation into one of the shoulder. Indeed, many accoucheurs have supposed that irregular or partial contractions might convert, during labor, a favorable position in one of the trunk; this is barely possible. But I cannot as readily admit the supposed influence which, according to some others, those uterine contractions may have, that torment the woman during the last few days, or sometimes even weeks of her gestation, and which have before been considered as the preludes of labor. The following is a case in point: A patient, in whom the fœtus presented by the shoulder five times successively, had always suffered from these pains during the last few days of her pregnancies; Professor Nægèle, under whose care she came on the sixth accasion, endeavored this time to calm the pains, which again appeared with the same energy as in the preceding gestations. After the ineffectual administration of various remedies, he finally ordered opiate injections, when, to his great satisfaction, the spasms ceased almost immediately, and were not again renewed, and the woman was delivered at full term of a living child, which presented in a favorable position. But what does this prove? simply that, whatever may be the child's position, these pains, the preludes of labor, may appear, and that vicious positions may be reproduced in the same woman with a most deplorable perseverance. It must be evident that such contractions are too feeble to change the child's position in any way, especially when we remember that the integrity of the amniotic sac, and the presence of the waters, likewise protect it from any influence they might have.

§ 2. DIAGNOSIS.

There is sometimes reason to suspect a trunk presentation, even before the commencement of labor, from the following signs: the abdomen is much larger in its transverse diameter than usual, and when its walls are soft and flabby, they can often be depressed enough to detect the fœtal head in one of the iliac fossæ, presenting there as a hard, rounded, and resistant tumor; then by placing the hands opposite each other in the lumbar regions, a greater and firmer resistance offered by the two extremities of the fœtal ovoid will be felt at these points, and the solid body, formed by the child, may be readily moved from side to side, thus proving that its long axis lies transversely above the superior strait. Finally, the tumor formed by the head, in the vertex presentations, is no longer detected by the vaginal touch, and it is almost impossible to reach the presenting part; in some rare instances, the elbow, or the little hand of the child, may be recognized and ballotted, and this sign, accompanied by the first two, renders the diagnosis quite probable.

The form of the abdomen is then very irregular, especially if the uterus should contain but a small quantity of amniotic fluid. It has, however, been observed, that after the discharge of the waters, the longitudinal diameter gradually becomes greater than the other; because, as M. Hergott remarks, the transverse position has no longer a real existence, for the body of the fœtus is so curved upon itself that one of its extremities is lodged in the fundus of the uterus, although the other does not correspond to its orifice.

[Although the use of auscultation in breech presentations is but of doubtful advantage, M. Depaul thinks that it may enable one to arrive at a correct diagnosis when the back of the fœtus is directed forward. In this case, he says, everything is arranged favorably for the recognition of the maximum intensity of the sound, which will be found at the anterior part of the lower segment of the uterus as in head presentations. In proportion, however, as the position assumes a transverse direction, the difference becomes much more decided, inasmuch as the sound, instead of being heard in a lessening degree toward the fundus of the womb, then extends in an almost horizontal direction, from one iliac fossa to the other, for example, and will be absent from a large portion of the upper region of the organ.]

Though M. Depaul's opinion is rational and founded on fact, it is none the less true that trunk presentations would almost always remain undetected if we had to depend upon auscultation for their recognition.

Sometimes, however, it may prove a useful auxiliary. If, for example, a small member of the fœtus be detected by the touch, and the pulsations of the heart are heard in the hypogastric region, we may conclude almost certainly that the member belongs to the upper extremity. Should the heart be heard on a level with the umbilicus, it would most probably prove a pelvic extremity.

Before the membranes are ruptured, the elevation of the part renders the vaginal touch very difficult; and so, of course, the form of the bag of waters, or that of the uterine orifice, can be of but little service. According to Madame Boivin, the os uteri dilates more slowly, but as this slowness of dilatation is met with in all presentations, excepting those of the vertex, it forms a sign of minor importance; the touch, therefore, can only give a positive certainty after the rupture of the membranes. When the side is the presenting part, the shoulder (Lachapelle) is very frequently found at the centre of the superior strait, as also the elbow, or the side of the chest (P. Dubois), and hence will be the first encountered by the finger in making an examination; and we therefore have to point out the characters, successively, whereby these several parts may be recognized.

1. When the shoulder presents, the finger first detects the rounded tumor formed by its summit, upon the surface of which a small osseous projection, constituted by the acromion, is distinguished; then, behind or in front, according to the position, the clavicle and the spine of the scapula are felt, and below the clavicle the intercostal spaces are easily made out, whilst under the spine of the scapula there is only a plane surface, terminated by the acute inferior angle of this bone, which is movable and permits the finger to slip under it; lastly, on the sides of the tumor formed by the shoulder, the axillary space can always be distinguished, and sometimes also (though on the opposite side) the depression in the neck can be felt.

The shoulder being once recognized, we must next determine which one it is, and what is its position. I will remark, in advance, that we have admitted but four positions of the trunk, namely, two for the right shoulder and two for the left, and that the relation existing between the situation of the head and that of the child's posterior plane is different in each of these four. Thus, there are two positions where the head is to the left, namely, the first position of the right and the first of the left shoulder; and remark that, in the latter, the child's back is turned towards the mother's loins; in the former, on the contrary, it is in front; and, therefore, whenever the head is to the left and the child's back is behind, we have to treat with a first position of the left shoulder.

In the same way, there are two positions in which the head is to the right, to wit, the second of the right and the second of the left shoulder; but again observe, that in the latter the back looks forwards, while in the former, on the contrary, it is directed posteriorly. Hence, to recognize a second position of the left shoulder, it will only be necessary to ascertain that the child's head is turned towards the mother's right side, and that its back looks anteriorly. In a word, to satisfy ourselves which is the presenting shoulder, and what is its position, we only have to find out where the head lies, and the position of the posterior plane of the child.

The shoulder presenting and being recognized, it is evident that if the axillary space looks towards the mother's right, the head will be to her left, and *vice versa;* consequently, the situation of the head is readily known by the direction of this space, and, as regards the child's dorsal plane, the omoplate will clearly indicate its position.

2. When the elbow alone is accessible to the finger, it may be recognized by the three osseous projections (the olecranon and the two condyles), which it presents by the transverse concavity in the bend of the elbow, and by the vicinity of the chest and intercostal spaces. The elbow having been distinguished, it will be necessary to make out the position to ascertain where the fœtal head and its dorsal plane lie, but this is now comparatively easy, since the elbow is always directed towards the side opposite to that where the head is found, and the forearm is always placed on the anterior plane.

Again, as above stated, it happens at times that the forearm is not doubled up, but that, on the contrary, the hand hangs down in the vagina, or even appears at the vulva. Now, to determine which is the presenting hand in those cases, it is necessary to turn it in such a way as to place its palmar surface in front and above, for, in this position, if the thumb be directed to the mother's right thigh, it is the right hand, but if to the left thigh, it is the left hand; and then, to find out where the head is, the accoucheur must slip his finger up to the axillary space.

[The advice just given would enable us to recognize with certainty the projecting hand; the misfortune is that it is so easily forgotten. Therefore we think it better that the operator should simply observe which of his own hands would fulfil precisely the conditions of that of the fœtus as to position, for then the diagnosis would be just as certain, inasmuch as, with the exception of the size, the right hand of an adult is formed precisely like the right hand of the child, and so with the left hands of both, whilst marked differences exist in the reciprocal arrangement of the parts composing a right hand and a left one.]

When the hand comes out at the vulva, a careful inspection of it will most generally be sufficient to establish the diagnosis. Thus, if its dorsal surface is turned towards the patient's right thigh, the head is at the right, and if to the left thigh, the head is at the left. The little finger, directed towards the coccyx, indicates that the child's dorsal plane corresponds to the mother's loins, and the same finger pointing to the pubis, is an evidence of this plane being in front.

We have been thus particular in the diagnosis, because it is all-important in trunk presentations to understand clearly which side presents at the strait, since the accoucheur must always endeavor to turn; and if the details just given prove difficult of comprehension from a single reading, we hope they will become clearer by practising on a mannikin.

§ 3. MECHANISM.

When the trunk presents at the superior strait, the labor nearly always requires the intervention of art; though, in some rare cases, which may be considered as altogether exceptional, nature alone is adequate to accomplish the delivery, which may then take place in one or two ways; for either the presenting shoulder is driven from the superior strait under the influence of the uterine contractions alone, to make room for one of the child's extremities, thereby producing a change in position, and giving rise to what is designated as *spontaneous version*, or else the presenting shoulder descends into the excavation and engages at the inferior strait; notwithstanding which, the breech sweeps along the whole anterior surface of the sacrum and of the perineum, and is delivered the first at the posterior vulvar commissure; this latter mechanism is called *spontaneous evolution*.

1. *Spontaneous Version.*—Where the membranes are not ruptured, though the labor has actually commenced, the fœtus sometimes enjoys a great latitude of motion in the amniotic cavity, in consequence of which it might, in such cases, readily change its position before the discharge of the waters took place; and it has been known to present, in this way, different points of its surface during the first period of the labor. Sometimes the head ascends in the womb while the breech descends; at others, on the contrary, the nates mount up towards the fundus uteri, and the head becomes located at the superior strait. Consequently, two varieties of spontaneous version have been admitted, *i. e.*, the *cephalic* and the *pelvic*.

This phenomenon usually occurs either just before or else soon after the membranes are ruptured; in some instances, however, it takes place a long time after the waters are discharged. The following case, reported by M. Velpeau, will give a very correct idea of what occurs under such circumstances: "A young woman, pregnant for the second time, came into the hospital at ten o'clock in the morning. The os uteri was very little dilated; nevertheless, I could recognize a second position of the left shoulder. The waters did not escape until three in the afternoon, and I did not wish to go after the feet, as the pains were neither very strong nor very frequent, and I had some confidence in the assertions of Denman on this subject. At eight o'clock in the evening, the shoulder had sensibly moved towards the left iliac fossa, and I could then readily detect the ear at the right. At eleven, the temple had almost gained the centre of the orifice; the contractions were augmented in energy; and the cervix was entirely effaced. At midnight, the vertex had become lower; the head engaged; and, in the course of an hour, the vertex was delivered in the right occipito-cotyloid position."[1]

This case, in which the progress of the labor has been followed and described, step by step, is well suited for explaining the mechanism of spontaneous cephalic version. The reader will easily comprehend that the same phenomena would take place, if the breech, instead of the head, descended towards the superior strait; and, in the above instance, for example, the shoulder, instead of being driven towards the left iliac fossa, would be forced to the mother's right, and then the side of the chest, the loins, the left hip and thigh, would successively appear at the upper strait, and the breech finally engage in the excavation.

In a shoulder presentation, the arm and hand may hang down in the vagina, or even protrude beyond the vulva; but this last circumstance does not preclude the possibility of a spontaneous version, only it is well to bear in mind that the arm may then ascend again into the uterine cavity, and this will almost certainly happen if the pelvic extremity descends into the excavation, but it may also lodge on one side of the pelvis, and thus permit the head to descend alongside of it; the presentation of the cephalic extremity being then complicated by a procidentia of the arm and hand. In the present state of our science, it would be a very difficult matter indeed to point out the various causes, under the influence of which it is sometimes the head, and sometimes the breech, which thus, in cases of spontaneous version, take the place previously occupied by the shoulder, at the superior strait. Nevertheless, I am inclined to believe that irregularity of the uterine contractions is not wholly foreign to such an effect. In fact, when we shall speak hereafter of what the German accoucheurs have described under the name of *Partial Contraction of the Womb,* it will be seen that, in some cases, the organ appears to contract in but a limited part of its extent, the remainder contracting with much less force, or even perhaps remaining entirely inert. Now, without being able to cite a single instance in support of my opinion, I am strongly inclined to believe, that it is in such a condition of the uterine walls that spontaneous version would be the most likely to take place. Let us suppose, for example, that when the child is placed in a left cephalo-iliac position of the right shoulder, the left side of the uterus alone contracts, the right remaining passive; it is manifest that the whole expulsory effort, being then exercised on the head, would necessarily depress it towards the centre of the superior strait; and this movement of the cephalic extremity will be easy, in proportion as the inertia of the right lateral wall of the womb shall oppose no obstacle to the elevation of the pelvic extremity. But if, on the contrary, (in the same position of the child), the right side of the womb only contracted, it is evident the breech alone would receive the impulse from the uterine efforts, and then a spontaneous podalic version would be observed to take place.[1]

---

[1] With regard to the case in the text, I may say briefly, that the course of M. Velpeau was legitimized by the desire he had of testing the opinions at that time (1825) in dispute: but young practitioners should be very cautious how they make such experiments; for although, in the hands of a man like Velpeau, the version, at an advanced period of labor, would have been comparatively easy, yet it must never be forgotten that, in trunk presentations, the soonest possible period after the rupture of the membranes is the most favorable for the artificial version.

2. *Spontaneous Evolution.*—The mechanism of spontaneous evolution is much better understood, and we shall find embraced in its descriptions all the divisions of the mechanism of natural labor in the vertex and face presentations. Here, also, M. Velpeau has admitted two varieties, that is, a spontaneous cephalic, and a spontaneous pelvic evolution. But we cannot conceive how a spontaneous cephalic one can take place, unless it be in cases of abortion, or in those where the child is completely putrefied; hence we shall treat of the pelvic variety alone, taking, as an example, the first or left cephalo-iliac position of the right shoulder, in which the child's head is placed in the left iliac fossa, the breech in the right iliac fossa; the dorsal plane being in front, and the sternal one behind, and the long axis situated very nearly in the direction of the transverse diameter of the upper strait.

Under such circumstances nearly all the waters escape immediately after the membranes are ruptured; then the uterus contracts forcibly, and by compressing the fœtal trunk on all sides, has a tendency to make the presenting part engage in the excavation.

A. *First Stage. Doubling up of the Child.*—Under the influence of the uterine contractions, the child is strongly bent in the direction of its long axis towards the side opposite to the presenting one; for instance, in the case before us, the head is bent to the left side, and the breech towards the hip of the same side.

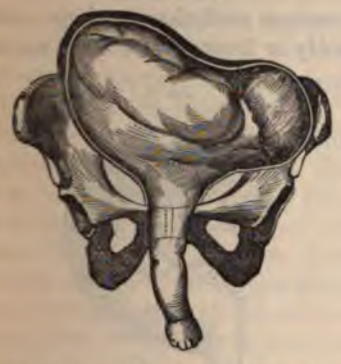
B. *Second Stage. Engagement.*—A second stage, the period of *descent,* then sets in; that is to say, in proportion as the contractions are renewed, the shoulder approaches more and more towards the inferior strait, and the fœtal trunk, being bent double, engages deeply in the excavation. But the same difficulty is here met with as in the face presentations (see *Positions of the Face*); that is, the body being thus placed transversely, it is impossible for the shoulder to reach the lower strait unless the head engages simultaneously with it in the excavation; or, indeed, unless the neck should be long enough to subtend the height of the lateral wall of the latter, which we have already seen is impossible (see *Mechanism of Face Positions*). The descent of the shoulder is therefore limited to the length of the neck.

---

[1] It is proper for me to acknowledge that Wigand had already given a similar explanation.

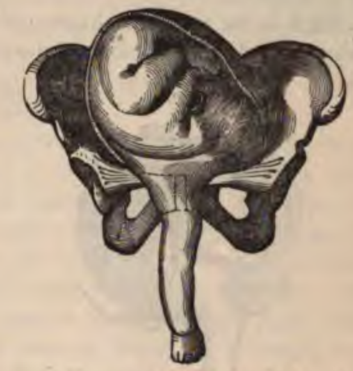
C. *Third Stage. Rotation.*—A movement of *rotation* next occurs, by which the long axis of the child, that was originally placed transversely, is brought very nearly into an antero-posterior direction, so that its cephalic extremity is placed above the horizontal branch of the pubis close to the spine of that bone, and the breech above, or rather in front of the sacro-iliac symphysis. This process of rotation being once effected, the descent may now be completed, since the side of the neck is placed behind the symphysis pubis, whose whole length it can subtend; consequently, the forearm and arm are found to appear at the vulva, and the shoulder to get under the arch of the pubis.

FIG. 88.



First position of the right shoulder with the arm hanging down.

FIG. 89.



The same position during the descent.

D. *Fourth Stage. Disengagement of the Trunk.*—The trunk, being now bent double, is forced *en masse* into the excavation, under the influence of the powerful uterine contractions, but the shoulder can descend no further, because it is arrested by the shortness of the neck; hence, the expulsive force acts on the pelvic extremity, which is pressed more and more towards the floor of the pelvis, and traverses the whole anterior face of the sacrum. It then rests against, depresses, and forcibly distends the perineum; the vulva soon dilates, and the *acromion remaining always fixed under the symphysis*, the following parts are observed to appear successively at the anterior perineal commissure: first, the superior lateral parts of the chest; next, its inferior part, the loins, the hip, the thighs; and lastly, the whole length of the inferior extremities; and there remain only the head and the left shoulder in the excavation. This last movement may be considered as the fourth stage of the labor, and it is therefore named the period of *deflexion* or disengagement. It takes place around the shoulder, situated under the symphysis as a centre, and therefore, if lines be drawn from this centre, terminating at the various points on the child's side, we shall have all the radii, or the fœtal diameters, which clear the antero-posterior one of the inferior strait.

[E. *Fifth Stage. Rotation of the Head.*—When by spontaneous evolution the body has been disengaged, the conditions have become the same as in breech presentations. In the fifth stage, therefore, the head rotates so as to bring the occiput behind the symphysis pubis.

F. *Sixth Stage. Expulsion of the Head.*—In the last stage the head is delivered as in breech cases.]

Such is the exact mechanism of the spontaneous evolution in those cases where the child's posterior plane was originally in front; or, in other words, in a first position of the right or a second of the left shoulder, for there is no difference in this last, excepting that the movement of rotation must take place in the opposite direction, that is, the head must pass from right to left and from behind forward, and the breech from left to right and from before backwards. But when the sternal plane of the fœtus is primitively directed towards the mother's front, as in the first position of the left, and the second one of the right shoulder, the process takes place somewhat differently. M. P. Dubois, who had an opportunity of seeing two cases of this nature, informed me that, at the moment when the breech disengaged at the anterior perineal commissure, the child's whole trunk underwent a movement of torsion that again brought its dorsal plane forwards and upwards, which plane, without this process of torsion, would still have been directed towards the anus; whence we find, even here, remarkable as it may seem, the influence of that general law which was observed to regulate all natural labors, namely, that, *whatever may have been the original relations of the child's posterior plane, it ultimately comes into correspondence with the anterior parts of the pelvis.*

FIG. 90.

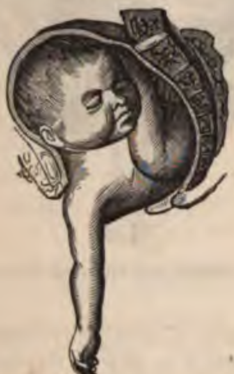


FIG. 91.

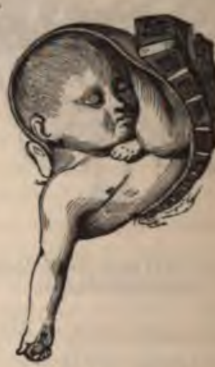


FIG. 90. Position of the child after the rotation, and just at the moment when the process of disengagement begins.

FIG. 91. The same position with the delivery more advanced.

As observed in the commencement of this article, the mechanism of spontaneous evolution may be subjected without impropriety to the same divisions as the delivery by the face. In fact, we have a first period of *flexion* of the child's trunk towards the side opposite to the presenting one; a second, of *descent*, interrupted by the third movement, or period of *rotation;* a fourth, of *deflexion*, or *disengagement*, and a fifth and sixth, during which the head rotates, and is finally expelled.

§ 4. PROGNOSIS.

We again repeat, for it seems highly important that this should be firmly impressed on the mind, that in trunk presentations a spontaneous expulsion of the child is wholly an exception to the general rule, and one upon which no reliance can be placed, unless in a case of abortion; and that the resources of our art are demanded in every case just as soon as the necessary conditions exist for such intervention. (See *Version.*)

In fact, by consulting the published cases, or indeed by simply reflecting on the mechanism by which the delivery is effected, we realize how this must expose the woman to a very long and painful labor, and the fœtus to so violent a compression that its death must often result in consequence. According to the statistics furnished by M. Velpeau, one hundred and twenty-five children, in one hundred and thirty-seven, were still-born. It must not be supposed, however, as some persons appear to have done, that this mode of delivery is only possible in cases of abortion; for facts too numerous militate against this opinion for it to be any longer tenable.

Burns justly remarks, in endeavoring to demonstrate the physical possibility, that the greatest diameter measures five inches and a half; sometimes the distance is barely five inches, and continued force may make it less; hence, provided the dimensions of the pelvis are slightly greater than in their normal condition, there is nothing here physically impossible, as has been affirmed and reaffirmed, doubtless without mature reflection. The favoring circumstances which render a spontaneous evolution easier and more likely to take place are: a premature labor, the smallness of the child, a large pelvis, strong contractions, diminished resistance from the soft parts, numerous antecedent labors, and the readiness with which the woman has heretofore been delivered of large-sized children. The opposite circumstances would render it exceedingly difficult, if not wholly impossible.

ARTICLE VI.

REVIEW OF THE MECHANISM OF LABOR IN GENERAL.

A curious fact in the mechanism of labor, and one which has claimed the attention of all modern accoucheurs, amongst whom we may mention especially MM. Dubois and Jacquemier, is, that whatever the presentation may be, the movements undergone by the fœtus during its expulsion are always the same. Finally, Professor Pajot made a clear statement of this single mechanical law, and applied it to all the presentations. "We maintain," he says, "that all labors, so far as the mechanical phenomena which they present are concerned, are governed by the same law. *There is, in fact, but one mechanism of labor, whatever the presentation and position may be,* provided the expulsion takes place spontaneously, that is to say, without the intervention of art and at term, for in cases of abortion the expulsion is not of the regular character." (Pajot, *Dictionnaire Encyclopédique des Sciences Médicales.*)

We accept fully this view of the subject, and repeat that all spontaneous labors obey the same law as respects their mechanism. The presenting part of the fœtus is first modified, as to its size or direction, in order to adopt it to the opening of the superior strait; then it descends into the cavity of the pelvis, and having reached the inferior strait turns, so as to present its longer diameters to the longer diameters of the pelvis, and not until it has undergone this series of movements is the vulva cleared and the expulsion complete.

We have thought that the transition would be easier from this simplicity of facts to the region of theory, if the classification of the different stages of labor were somewhat modified. Although the most recent classifications are wonderfully simplified, they still fall short of entire uniformity, presenting here and there some omissions and a few contradictions. For instance, in deliveries by the vertex or face five stages are described, the first four of which are really executed by the head, then the rotation of the body is described as the fifth and last time, without considering its final expulsion, which is merely mentioned. The disengagement of the body being thus disregarded, students are liable to forget an important cause of dystocia described by Jacquemier, viz., the large size of the shoulders. In cases of delivery by the head, a fifth stage, that of rotation of the body, is described, why, therefore, not be logical throughout and admit a sixth stage for its expulsion?

In breech labors, four or even five stages are commonly described. It is well, indeed, to recognize, as do MM. Dubois and Pajot, a first stage for the diminution in size and modelling of the presenting part; then the engagement, rotation, and expulsion of the body will correspond with the second, third, and fourth stages. Up to this point there is entire uniformity between labors by the head and breech, but for the fifth stage in breech cases we have a confused account of the internal rotation of the head and its final expulsion. The fifth stage, which in a uniform nomenclature ought to recall similar things, would, in this case, seem to imply a notable difference between the various kinds of delivery; for, in the same stage in vertex presentations, the body rotates without being expelled, whilst in breech cases the head rotates and is expelled at the same time. In order, therefore, to remove this apparent difference, it were better to divide the fifth stage of delivery by the pelvis into two stages, the fifth for the internal rotation of the head, and the sixth for its final expulsion. The throwing of these two stages into one, is essentially the same as confounding the third and fourth stages of delivery by the vertex.

In order to remove these imperfections and contradictions we have, therefore, described six stages in the mechanism of labor in each of the presentations; an innovation which has the advantage of showing clearly that this mechanism is uniform throughout. These views have been taught in our lectures, in the text of the *Atlas Complémentaire de tous les Traités d'Accouchements*, by Lenoir, and one of our students has made it the subject of his inaugural thesis. (Granier. *Théses de Paris*, 1863, No. 98.)

For the clear understanding of this uniformity of the general laws of the mechanism of labor, we should observe in the first place that the fœtus, doubled up as it is in the cavity of the uterus, with its limbs pressed closely against the chest, and the neck concealed between the base of the head and the upper part of the chest, forms really but two distinct parts, the head and the body. Now let us for a moment imagine these two parts to be separate and independent, and that they presented themselves one after the other; then we should have four stages for the expulsion of each. The head would be flexed, engage, rotate, and be delivered; nor would this succession of phenomena be in any respect altered whether the engagement of the head should precede or follow that of the body. The delivery of each of these two parts of the fœtus would then present similar phenomena to the observer; nor will there be the least occasion for surprise, when we consider that the section of each presentation gives an almost oval figure, the longer and shorter diameters of which are adapted in the same way to the curvature and form of the genital passages.

Setting hypotheses aside, if we examine a fœtus closely, we shall be at once struck with the fact that it represents two superposed masses, the head and the body so united by the neck that one cannot progress without the other; and that whilst the presenting part undergoes its four movements of compression, engagement, rotation, and disengagement, the remaining part has also become flexed and engaged, in other words, has performed its two first movements.

On the other hand, we observe, whilst examining a fœtus, that the long diameters of its two superposed parts (head and body) have opposite directions, from before backward for the head, and transverse for the body. These two diameters are also at right angles to each other, whence it happens that when one of the two parts has a direction adapted to its ready exit from the pelvis, the other will have an opposite direction. For example, when the head disengages from before backward at the vulva, the shoulders are situated transversely at the inferior strait; which renders it necessary that the head and body should perform successively the same mechanical movements of rotation and disengagement.

If we note, therefore, such mechanical phenomena only as are apparent and palpable, such, in fact, as the accoucheur is expected to detect at any moment, we shall have in the first place to observe successively the four motions performed by the part which engages first, and next the final movements of rotation and expulsion of the second part of the fœtus.

We have thus to describe six stages in the delivery:

1st Stage	Compression	of the first fœtal part.
2d Stage	Engagement	
3d Stage	Rotation	
4th Stage	Disengagement	of the second fœtal part.
5th Stage	Rotation	
6th Stage	Expulsion	

In the following table are recapitulated the six stages in the mechanism of labor for all the presentations.

TABLE of the six Stages of Labor in all the Presentations.

1st Stage. Adaptation of the presentation	Taking place in presentations	of the vertex	by flexion.
		of the face	by extension.
		of the breech	by folding.
		of the body	by folding.

2d Stage. Engagement.	Taking place in presentations	of the vertex	by sliding.
		of the face	by sliding.
		of the breech	by sliding.
		of the body	by sliding.
3d Stage. Rotation of the presentation.	Bringing under the arch of the pubis	the occiput	for the vertex.
		the chin	for the face.
		a hip	for the breech.
		a shoulder	for the body.
4th Stage. Disengagement.	Taking place in presentations	of the vertex	by extension.
		of the face	by flexion.
		of the breech	by progression.
		of the body	by lateral flexion.
5th Stage. Rotation of the second fœtal part.	Bringing under the arch of the pubis	a shoulder	in cases of vertex presentation.
		a shoulder	in cases of face presentation.
		the occiput	in cases of breech presentation.
		the occiput	in cases of body presentation (spontaneous evolution).
6th Stage. Final expulsion.	By disengagement	of the body	in cases of vertex presentation.
		of the body	in cases of face presentation.
		of the head	in cases of breech presentation.
		of the head	in cases of body presentation (spontaneous evolution).

By applying this general classification to each presentation separately, we obtain entire uniformity for the mechanism of every kind of labor.

VERTEX.

1st Stage	Flexion of the head.
2d Stage.	Engagement of the head.
3d Stage.	Rotation of the head.
4th Stage	Disengagement of the head.
5th Stage	Internal rotation of the body.
6th Stage	Expulsion of the body.

FACE.

1st Stage	Extension of the head.
2d Stage.	Engagement of the head.
3d Stage	Rotation of the head.
4th Stage	Disengagement of the head.
5th Stage	Internal rotation of the body.
6th Stage	Expulsion of the body.

BREECH.

1st Stage	Folding of the breech.
2d Stage	Engagement of the breech.
3d Stage	Rotation of the breech.
4th Stage	Disengagement of the breech.
5th Stage	Internal rotation of the head.
6th Stage	Expulsion of the head.

BODY. (*Spontaneous evolution.*)

1st Stage	Folding of the body.
2d Stage	Engagement of the body.
3d Stage.	Rotation of the body.
4th Stage	Disengagement of the body.
5th Stage	Internal rotation of the head.
6th Stage	Expulsion of the head.

CHAPTER IV.

TWIN LABORS.

Although the expulsion of the child often takes place in twin pregnancies with as much facility or sometimes even with greater rapidity than in ordinary labors, yet it must not be supposed that the whole duration of the labor is always shorter; for very often, on the contrary, the parturition will be found to drag along, and become tedious. Indeed, by reflecting on the circumstances which then complicate the process, it will not be a difficult matter to explain this unusual delay, since it is well known that an excessive distention of the womb greatly diminishes both the force and frequency of its contractions; and, as the labor often comes on before the end of the ninth month, the cervix uteri has not yet undergone those modifications which usually render its dilatation at term quite easy; besides which, the elevation of the presenting part, whose engagement is impeded by the presence of the second fœtus, also assists in retarding this dilatation. The stage of expulsion, which the small size of the twins would at first sight seem to facilitate, is often delayed by the feebleness of the contractions, and also by the decomposition and considerable loss of the force occasioned by the presence of an ovum, still remaining intact within the cavity of the womb; and such is the unfavorable influence of this latter circumstance, that it is only through the thickness of the second ovum that the contractions of the greater part of the uterine fibres can possibly reach the body of the child that first presented at the upper strait. But when the first child presents by the pelvic extremity, the escape of the head is particularly apt to be attended with difficulties; for, if the perineum be resistant, even in a slight degree, as in primiparæ, for example, the intervention of art will nearly always be indispensable, because the uterus, being wholly occupied by the other ovum, can have no further influence on the head of the first.

The following table, which gives the presentation of both children in three hundred and twenty-nine cases of twin pregnancy, will serve, as a matter of curiosity, to show the relative frequency of the positions.

IN 329 TWIN PREGNANCIES, THE TWO CHILDREN PRESENTED AS FOLLOWS:			
Both by the head. 134 times.	The 1st by the head; the 2d by the breech. 55 times.	Both by the breech. 12 times.	The 1st by the breech; the 2d by the head. 31 times.
The 1st by the breech; the 2d by one foot. 11 times.	Both by the feet. 8 times.	The 1st by the feet; the 2d by the head. 29 times.	The 1st by the breech; the 2d by the elbow. once.
The 1st by the head; the 2d by the shoulder. 7 times.	The 1st by the face; the 2d by the head. once.	The 1st by the feet; the 2d by one hand. once.	The 1st by the feet; the 2d by the breech. once.

Nearly always the twins present one after the other at the superior strait, and the expulsion of the first is promptly followed by the birth of the second; and the same is true of the others when there are more than two. But it occasionally happens that the labor does not progress so regularly, and that the children may be born at a considerable interval from each other, and their expulsion rendered difficult by the attendant delays and dangers. It most generally happens that the womb, being fatigued by the efforts necessary for the expulsion of the first-born, retracts a little after this partial depletion, and remains in a state of rest for some minutes, in consequence of having lost a part of its contractile properties; still retaining, however, a greater volume than usual. By placing the hand on the anterior abdominal region, the accoucheur will be able to verify the abnormal size of the organ, and to detect, through this wall, the inequalities appertaining to the fœtus; besides, another amniotic pouch, or the presenting part of a second child, can readily be detected at the upper part of the uterine neck by the vaginal touch. In general, the repose of the womb is but momentary, and in about a quarter of an hour, sometimes at the end of five or ten minutes, though rarely later than twenty or thirty minutes, the patient feels the pains coming on again; at first feeble and slow, but soon becoming stronger and more energetic. Care should be taken to rupture the membranes, if this had not already occurred, and then to abandon the rest of the labor to the powers of nature. This second delivery is soon over, as a general rule, when the fœtus presents in a natural position, for the parts have been so enlarged by the passage of the first child, that they offer but little resistance to the escape of the second. But in some cases, the pains which have been suspended after the birth of one of the twins, do not reappear for some hours, and sometimes even not for several days.[1]

Now, what is to be done in cases of this kind?

"When the two children present well, and the expulsion of the first is effected naturally, and without great fatigue to the woman, I wait," says Merriman, "until the pains of the second childbirth come on; ordinarily, this happens shortly after the escape of the first-born. If efficacious pains do not occur in the course of a quarter or half an hour, I provoke the contraction by rubbing the abdominal tumor gently with the hand, and by titillating the os uteri with the finger; if these irritations, made simultaneously on the body and neck, are ineffectual, and several hours elapse without the womb contracting, I deem it advisable to excite the contractions, by rupturing the membranes, after having previously administered the ergot. This course is based on the two following reasons: where we have delayed too long a time, the pains have always appeared to me more severe than they would have been if the action of the uterus had been solicited sooner; and the expulsion of the second child has commonly seemed to me more easy through the parts recently dilated by the first delivery."

---

[1] Four women, registered in the Dublin Hospital, were delayed ten hours in the delivery of their second child. The reader will also find, in the *Medical and Physical Journal* (April, 1811, the details of a case in which the second child was not born until fourteen days after the first; and the author of that communication states, that another case had come to his knowledge, in which six weeks had elapsed between the birth of the twins. A woman was delivered on the 4th of March, 1814, of two children; she found herself so well on the second day that she rose to attend to her affairs, but, on the sixth, she was again delivered of two more. (*Gentleman's Magazine*, 1814.)

In all such cases, our rules of conduct should be based on the condition of the womb itself, rather than on the length of time that may have elapsed since the birth of the first child; because it must be evident that relaxation and inertia of this organ would forbid all attempts at extraction, and that we should never endeavor to deliver the second child before having excited the organic contractility of the uterus, by all the available means. If, by chance, these measures prove inadequate, it will be better to wait several hours, or, if necessary, even for several days, rather than expose her to the terrible consequences resulting from inertia.

[The presentation and position of each child in twin labors are detected by the same signs as when one child only is present, observing, however, that it is necessary to be careful in respect to the data supplied by palpation and percussion, for the presence of two children in the womb alters greatly the results afforded by the former; so that although these measures may sometimes prove helpful, they may also very easily lead into error.

That auscultation is equally unreliable and may be deceptive, will be understood from the fact that the idea of the position of the first child may be formed from the maximum intensity of the cardiac pulsation of the one which is born last.

What has been already said in regard to the touch, will suffice for twin cases also, although difficulty may arise from the simultaneous engagement of both children—for which case we refer to the subject of *dystocia.* (See *Dystocia.*)

The expulsion of each child is subject to the usual laws which govern the mechanism of labor as already described, so that we have only to add that as twins are often small and born prematurely, the inequalities in the mechanism of labor are more common, especially as regards the second child, which traverses the genital passages which have been enlarged by the first one. In short, we have only to regard a twin labor as two successive deliveries.]

CHAPTER V.

OF PREMATURE AND RETARDED LABORS.

ARTICLE I.

OF PREMATURE LABOR.

WHEN a woman is delivered in the seventh or eighth month of her gestation, the labor is said to be premature. Now a great number of causes may determine the expulsion of the child, before the ordinary term of its intra-uterine life; such, for instance, as an excessive distention of the womb, whether this be occasioned by too great a quantity of the amniotic liquid, by hydrorrhœa, or by the presence of two or more infants in the uterine cavity; the accidental death of the fœtus; the artificial evacuation of the liquor amnii; any violent muscular effort; the abuse of strong purgatives; various acute diseases, more especially those of the skin; and certain conditions of the animal economy, as plethora, great debility, or an excessive irritability and sensibility. Finally, in a singular case already mentioned, premature labor occurred eight times consecutively, in consequence of extreme itching of the surface.

Delivery before term is said to be often preceded by a severe chill. Burns supposes that this chill occurs immediately before or after the death of the fœtus. I have no recollection of having observed anything of the kind.

In some cases, the uterus is fully developed prior to the ordinary term of gestation, and then the contraction commences and goes on as regularly as usual; but in most instances, the organ has not as yet undergone all the necessary modifications for the proper accomplishment of labor, and the latter, consequently, exhibits numerous irregularities in its course. The uterine neck and orifice are not yet properly effaced and softened. For example, it is not at all uncommon to find the neck sufficiently dilated, during the primary pains, to permit the introduction of the finger, and this notwithstanding the lips are still thick and of a considerable length. This length of neck must greatly retard the dilatation, for the latter cannot really commence until after the effacement is completed, which often proves a tedious process.

This first, or preparatory, stage is marked by pains that are very irregular both in their duration and intensity, accompanied by a feverish state; the patient experiences a very distressing sensation of weight about the belly, and she is usually restless and agitated. When the cervix is once effaced, the os uteri begins to dilate; but this dilatation is much slower than at term, because the neck has not yet attained the same degree of softening, and therefore offers more resistance to the contractions of the body.

But, although the first stage is somewhat longer, the second, or that wherein the expulsion occurs, is generally shorter than in labor at term, owing to the small size of the child; nevertheless, this advantage is often counterbalanced by the irregularity and the spasmodic nature of the contractions, which are then more apt to assume this form than under ordinary conditions. For, as the muscular organization of the uterus is not yet complete, we can understand why its contractile powers are less perfect; and also, on the other hand, how the morbid cause which has developed a premature action in it must necessarily influence the regularity of their contractions.

The vertex presentations are far from being so frequent here as in the natural labor at term, and those of the breech, according to M. P. Dubois, are proportionably more common as the labor is more premature. For instance, in ninety-six still-born children, delivered during the last two months of gestation at the hospital of La Maternité, seventy-two presented by the head, twenty-two by the pelvic extremity, and two by the shoulder; whilst in seventy-three living children, who had only reached the seventh month of intra-uterine life, sixty-one presented the head, ten only the breech, and two the shoulder. Hence, it is evident that the number of pelvic presentations in premature parturitions is comparatively greater where the children are born dead, and also that, when the fœtuses are living, the podalic extremity presents first much oftener than in ordinary labors.

Finally, according to Burns, women who are taken in labor before term are more exposed than others to hemorrhages during its progress, and the delivery of the after-birth is both more difficult and more liable to accident than usual.

"When a woman is threatened with premature labor," continues the author just named, "we ought, unless we are sure of the death of the child, to endeavor to check the process, which is done by keeping the patient cool and tranquil in the horizontal position, bleeding her in the arm if she be plethoric, or the pulse be throbbing; but above all, by administering opiate injections immediately (forty to sixty drops of Sydenham's laudanum, in two or three doses, in the course of a couple of hours)."

When the labor is once established, it is to be conducted much in the same way with parturition at the full time; nevertheless, says Burns, the following observations should be carefully attended to: 1. The patient must avoid much motion, lest a hemorrhage be excited; 2. Frequent examinations are hurtful by retarding the process, and tending to produce spasmodic contraction; and, if this takes place, a full dose of the tincture of opium should be given at once; 3. A rigid state of the os uteri requires venesection to a moderate extent; 4. The delivery of the child is to be retarded rather than accelerated in the last stage, in order that the uterus may have time to contract on the placenta; 5. This is to be further assisted by rubbing and gently pressing on the uterine region after the child is born; 6. The delivery of the after-birth requires more than ordinary care (see *Delivery of the After-birth*): thus, we are not to pull on the cord, for it is easily broken; besides, it is often necessary to introduce the hand in the uterus to aid the detachment of the placenta artificially, and to prevent its being retained by the irregular contractions; and lastly, great attention is to be paid to the patient herself for some days after the delivery, for it has justly been observed that she is, from the mere fact of having had a premature labor, more exposed than others to those inflammatory affections which so often complicate the parturient state. With regard to the premature labors brought on by the accoucheur we shall say nothing at present, as we shall have to treat of them more particularly under the head of *Operations.*

ARTICLE II.

OF RETARDED LABOR.

As an ordinary rule, the pregnancy terminates about the two hundred and seventieth day after conception. However, labor often occurs at an earlier period than this, and, on the other hand, it may not appear until some time in the course of the tenth month, or even at the termination of this period, although the latter is a much more unusual circumstance. In making this statement, we decide a question in advance that gave rise to some very sharp and animated discussions during the last century; and, still more recently, the tribunals of England have summoned to their bar the most celebrated physicians of Great Britain, and have listened to numerous and protracted pleadings for and against the legitimacy of retarded labors.

But this question no longer presents to the medical jurist the same difficulty that it did in the past century, for the French law has now declared every child to be legitimate that is born after the one hundred and eightieth or before the three hundredth day of marriage; and, as if it were possible, in the eye of the law, for a pregnancy to continue more than ten months, it further adds that the legitimacy of a child born three hundred days after the dissolution of the marriage contract *may be* contested.

Although a legal decision has thus deprived the question of retarded labors of its greatest interest, yet we, as practitioners, may be permitted to recall briefly the principal reasons that militate in their favor.

At first, it was very natural to study the process in those animals which approach the nearest to man in this respect, in order to judge of the possibility of a retarded birth in the human species.

Among the numerous observations made on this subject, those submitted by M. Tessier, in 1819, to the Academy of Sciences at Paris, of which the following is a summary, are probably the most exact, namely: out of one hundred and seventy-one cows, fourteen calved from the two hundred and forty-first to the two hundred and sixty-sixth day: three on the two hundred and seventieth; fifty, from the two hundred and seventieth to the two hundred and eightieth; sixty-eight, from the two hundred and eightieth to the two hundred and ninetieth; and five, on the three hundred and eighth day, which gives a difference of sixty-seven days between the births, if we compare the shortest with the longest period. Of one hundred and two mares:

3	foaled on the	311th day.
1	“ “	314th “
1	“ “	325th “
1	“ “	326th “
2	“ “	330th “
47	“ from the	340th to the 350th day.
25	“ “	350th “ 360th “
21	“ “	360th “ 377th “
1	“ on the	394th day.
102		

Making a difference of eighty-three days between the two extremes. Nine months and ten days being the average term for cows, and eleven months and ten days for mares.

These well-ascertained variations in the terms of gestation in animals, certainly afforded a strong presumption of their existence in the human species also; for if cows and mares, whose gestations are not disturbed by the various causes that may lead to changes in a woman, may thus defer for some time the ordinary period, how much more would human females, who are subject to so many diseases, and upon whom the moral and social relations exert so powerful an influence,—how much more likely would they be to exhibit numerous varieties in the duration of their pregnancies?

But all this was a mere probability; and the question would still remain undetermined, if careful observations directly made, and well made on the human species, had not removed all doubts on that point; for several cases bearing on this subject now enrich our science, where a single well-established instance would suffice to produce conviction. Take, for example, the following case, reported by Desormeaux: A lady, the mother of three children, became affected with insanity, for which all the resources of therapeutics were tried in vain. As her physician thought that another pregnancy might possibly re-establish her intellectual faculties, the husband consented to note on a register the time of each sexual union, which only took place every three months, lest a previous conception (then uncertain) should be disturbed. Now, this lady, who was closely watched by her domestics, and was besides endowed with the most rigid principles of religion and morality, was not delivered before the expiration of nine months and a half.

Merriman furnishes a summary of one hundred and fifty gestations, in each of which he has noted the precise day of the last appearance of the menses. From this table it appears that—

5	women	were delivered	in the	37th	week—	*i. e.* from	252 to 259	days.
16	"	"	"	38th	"	"	262 to 266	"
21	"	"	"	39th	"	"	267 to 273	"
46	"	"	"	40th	"	"	274 to 280	"
28	"	"	"	41st	"	"	281 to 287	"
18	"	"	"	42d	"	"	288 to 294	"
11	"	"	"	43d	"	"	295 to 301	"
5	"	"	"	44th	"	"	303 to 306	"
150								

The foregoing statement exhibits the great variety in the length of gestation. There is, in fact, a difference of fifty-six days between the two extremes; and, supposing that each woman became pregnant five days before the return of her courses, five of them, at least, would overrun the average term of nine months by ten or twelve days.

CHAPTER VI.

OF THE DELIVERY OF THE AFTER-BIRTH.

THIS comprises the natural or artificial expulsion of the fœtal appendages from the mother's womb, and is the complement of the labor. Like the latter, it is generally accomplished by the unaided powers of nature, though in certain cases, which are fortunately very rare (about one in two hundred), it is attended by difficulties or complicated by accidents that may require the intervention of art. We shall, therefore, have to treat of the natural and the artificial delivery of the after-birth, the former of which, only will be described in this place and the latter included in the article *Dystocio.*

Whilst the expulsion of the fœtus is being completed by the spontaneous exit of the breech and lower extremities, or immediately after the expulsion, the walls of the uterus retract in virtue of their inherent contractility of tissue, and its cavity diminishes; but the placenta, being a spongy and non-contractile mass, does not follow this action of the organ. Consequently, it becomes puckered up, and the cellular and vascular tissues, that connect it to the internal uterine surface, are rendered tense and then torn, as the difference in the respective size of the two bodies becomes greater under the force of the repeated contractions. A rupture of all these bonds of union is soon effected, the placenta is completely detached and forced down upon the os uteri; the latter, being irritated by its presence, reacts on the body of the organ which is immediately thrown into contraction; the internal orifice, which was closed after the delivery of the child, again dilates, and the placenta, being driven from the uterine cavity, passes into the vagina, whence it is forced outwards by the contraction of the vaginal walls aided by the abdominal muscles.

Hence there are three distinct stages in the delivery of the after-birth; which we may divide, like Desormeaux, into the detachment of the placenta, its expulsion from the uterus, and its expulsion from the vagina.

The *detachment of the placenta* is not always accomplished in the same way; the process varying with the part of the uterus to which it is united. For instance, when attached to the fundus, the separation first begins near the centre of the mass, because this is the thickest part, and can least accommodate itself to the retraction of the uterine walls; whilst its thinner margins, being more easily wrinkled, are less liable to rupture the tissue connecting them with the womb; a lenticular cavity is thereby created, which is bounded externally by the still adherent borders of the placenta. A quantity of blood is gradually effused into this cavity, which contributes, with the uterine contractions, to effect the separation; thus, in this case, the detachment is effected from the centre towards the circumference. The placenta, being wholly detached, then descends to the orifice, its fœtal surface corresponding to the latter, and becoming the external face, whilst the uterine surface is the internal face, which, together with the inverted membranes, constitutes a pouch, wherein such a quantity of fluid or coagulated blood is occasionally collected, as to seriously impede its delivery.

When it is attached to the anterior, the posterior, or the lateral portion of the womb, the separation commences at one of the margins; or, if at the centre, it is soon propagated towards one border, generally the superior, though, in some instances, the inferior one. In the former case, the process advances in the way just described, and the placenta again presents, by its fœtal surface, at the cervix uteri; but, in the latter, being suspended on the uterine wall until the detachment is completed, it presents at the neck by its inferior margin. It is then generally folded upon itself, and engages in the orifice rolled up in a conical form.

When the placenta presents its fœtal surface at the os uteri, it plugs up the orifice by its bulk, and prevents the blood from escaping; wherefore, its delivery in such cases is usually followed by the expulsion of numerous large coagula. But where only one border engages, there is no obstacle to the issue of the blood, and hence the discharge of this fluid commences with the detachment of the after-birth, is increased at every pain, and persists throughout the whole process.

From the description just given, the reader would naturally suppose that the detachment of the placenta only begins after the child is born.; this, however, is not always the case. In fact, the following phenomena are more usually observed to take place: as soon as the labor-pains are developed and the dilatation of the os uteri has commenced, the separation of the ovum begins in the neighborhood of the uterine orifice, and then gradually progresses over all parts of its surface, although not in a perfect and complete manner. After the membranes are ruptured, and the waters are partially discharged, the uterine cavity diminishes; the ovum becomes wrinkled, and its detachment is carried to a still greater extent; even involving the after-birth, as proved by the fact that the fluid or coagulated blood is frequently expelled simultaneously with the fœtus, in cases of protracted labor; which blood must evidently come from that portion of the uterine surface in contact with the placenta. A separation of the greater part of the placental mass is particularly apt to occur in the breech presentations in consequence of the gradual contraction of the womb, as the lower parts of the fœtus are delivered.

The interval between the child's birth and the delivery of the secundines is very variable. Dr. Clarke, from a great number of observations, established its mean duration at twenty-five minutes; but if by this a perfectly spontaneous delivery is to be understood, one in which no traction is made on the cord, we believe he is in error, for this interval is generally much longer. At the instance of M. P. Dubois, we made some experiments, in 1836, with a view of determining this question; and those researches proved that, when the delivery was left entirely to nature, the final expulsion of the placenta did not usually occur under an hour or an hour and a half after the birth of the child. It is true, the detachment of the after-birth, and its removal from the uterine cavity, is effected, as Clarke states, in the course of fifteen, twenty, or twenty-five minutes; but, having passed into the vagina, it sometimes remains there for several hours without causing the least irritation by its presence, the least tenesmus, or bearing-down effort. This circumstance is easily explained by the fact that the sensibility of the vaginal walls is blunted, as it were, by the long pressure they were subjected to from the head and other parts of the child. Besides which, as Levret long since remarked, the after-birth will be the sooner expelled in proportion as the patient is stronger, and the contractions more energetic; as the quantity of water in the womb was smaller, and as the period between the rupture of the membranes and the delivery of the child was the longer.

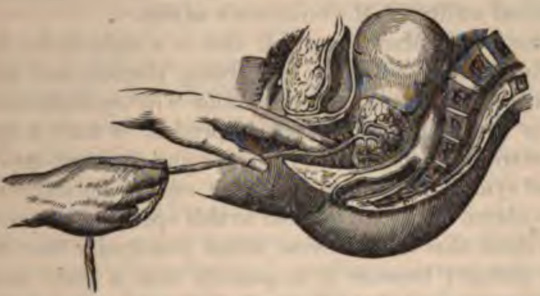
Although its delivery may generally be left to the powers of nature without any serious inconvenience, yet it is equally true that it will be delayed a long time in a large number of cases. Now, such a delay would force the patient to remain on a bed, which is poorly adapted for repose after all the fatigues of labor; and besides, so long as the delivery is not completed, she still considers herself exposed to numerous dangers, and her fears may have an unfavorable influence over her condition. On this account, most of the accoucheurs of the present day believe it advisable to accelerate the extraction a little, for the purpose of relieving the woman from her anxiety, and of sparing her unnecessary pain; without, however, attempting to deliver the secundines *immediately* after the child's birth. But, before making any traction on the umbilical cord, it is necessary to ascertain the situation of the placenta, and especially the condition of the uterus. If the latter is small, hard, and contracted, and situated in the lowest part of the abdomen, it is infinitely probable that the placenta is, in great part at least, expelled from the cavity of the womb into the vagina. This, however, may be easily ascertained, for the finger introduced into the vagina readily detects the mass, and even distinguishes the insertions of the cord. Ther is then, generally, nothing to prevent its being extracted at once, and simp tractions upon the external end of the cord are all that are required f this purpose.

When, on the contrary, the uterine tumor continues on a level with, even above the umbilicus, and has a soft doughy feel, due to its imperf contraction, the placenta is very probably still within the womb, and t first object should be to ascertain whether or not it is detached. Now know that the separation is usually accomplished by the fresh contractio that reappear after the apathy which follows the expulsion of the chil and hence, there is every reason to suppose it is completed when these co tractions have repeatedly occurred. A little blood usually escapes fro the vulva during the process. Finally, if one or several fingers be pass up to the uterine orifice, the after-birth is found presenting there, and, if should not be met with, the accoucheur may rest satisfied that the separ tion is not yet completed, and therefore he ought to wait. Should t detachment be delayed too long, frictions over the fundus uteri are resort to, for the purpose of rousing the pains, or the same object is produced b titillating the cervix uteri with one or two fingers. Great care should b taken not to make frequent tractions upon the cord, for unpleasant cons quences might result. Thus, if the placenta is completely adherent, th tractions are liable to detach a part, and give rise to hemorrhage, or the might tear away a portion of the after-birth and leave the remainder in th womb; again, the organ might be inverted or the cord ruptured thereby.

Certain writers recommend a ligature on the placental extremity of th cord after the child's birth, for the sole purpose of facilitating the detach ment of the after-birth. The easy separation when this has been done, say M. Stoltz, is caused by the weight and turgescence of this organ, whic when expelled, is found to be engorged with blood; this practice is attend with no inconvenience, and is at least beneficial by preventing the patien bed from being soiled with the blood that ordinarily escapes from the co

After its entire separation, the after-birth constitutes a foreign body the uterine cavity, which the organ endeavors to dislodge by contracti These contractions, which are recognizable by the hardness of the uteri globe, and which are usually perceptible to the patient, indicate the ti for operating; the accoucheur then takes hold of the umbilical cord, af having enveloped it with a cloth so as to prevent it from slipping, winds its end around one or two fingers; he next makes a moderate tr tion with a view of extracting it, but, as soon as any resistance is felt, ought to slip up two or even three fingers of the other hand along the up surface of the cord as far as the os uteri; the points of these fingers, wh are intended to press the cord backwards, are brought together so as receive the latter in the entering angle thereby formed, around whic plays like a pulley. To understand the advantage of this manœuvre, i only necessary to bear in mind that the tractions made by one hand al would correspond to the axis of the vagina, which forms an angle with that of the uterus; whence it happens that the placenta, instead of being drawn towards the centre of the orifice it has to traverse, would abut against its anterior border, and the corresponding parts of the cervix, upon which all the tractive efforts are spent. The patient should be directed to bear down while the tractions are made. As the placenta clears the orifice, and gets into the excavation, the operator changes the line of action, and gradually carries the cord forward, so as to make it always correspond with the axis of the pelvic canal. Under the joint influence of the tractions and the patient's bearing-down efforts, the placenta soon reaches the vulva, where it is seized by the thumb and fingers and twisted round several times, so as to complete the detachment of the membranes and form them into a solid cord, for the double purpose of preventing their laceration and of securing their entire removal.[1]

FIG. 92.



Mode of extracting the placenta.

It is impossible to state precisely the amount of force which may be used in these tractions upon the cord, and it must be left to the intelligence of the practitioner to discover what is proper to be done. When, however, the tractions have no effect, and the placenta seems to rise up and draw the cord after it, as soon as they have ceased, all efforts should be suspended for the time being.

"When the placenta is partially engaged in the orifice by a portion of its periphery, this plan," says M. Guillemot, "ought to be somewhat modified; for in this presentation, the root of the umbilical cord, instead of corresponding to the cervix, is higher up in the uterine cavity; and hence, if the operator resorts to traction, the centre of the placenta will have a tendency to enter the orifice, and thus add its bulk to the disk already engaged there. Such a disposition sometimes constitutes an obstacle to the further delivery of this mass; but it is surmounted by making some moderate tractions, not on the cord itself, but rather upon the part previously engaged, by applying two fingers on its surfaces." We have had numerous opportunities of testing the practical utility of M. Guillemot's advice.

---

[1] There certainly would be no very great danger in leaving a portion of the membranes in the uterine cavity; although, in addition to the accidents that may arise from the presence of a foreign body there, the following phenomenon might possibly occur. The membranes may inclose some coagula, and thus form a mass whose expulsion is often difficult. In the course of a few days, the uterus, being irritated by the presence of this inconvenient lodger, begins to contract, and the woman experiences some colicky pains, varying in intensity with the strength of the contractions; a little blood escapes from the vulva, and, after the pains have lasted for a longer or shorter period, the patient is finally delivered of the foreign body, or, according to her expression, of a *large piece of flesh*, the appearance of which causes great alarm.

"This seems," says Merriman, "all that it is right to do, for a full hour after the child is born; but that time being elapsed, and there being no reason to expect that uterine contractions will spontaneously arise, the accoucheur is to consider whether it is prudent to wait longer, before he proceeds to extract the placenta, by introducing his hand into the uterus.

"If no bad symptoms are present, there can be no danger in allowing more time to elapse before we proceed to this operation; especially, if there be reason to think that the retention arises principally from the exhausted state of the patient; because it is possible that a little more delay will recruit her strength, and that afterwards sufficient power may be imparted to the uterus to expel the placenta.

"Yet, generally speaking, we can have but little expectation that the placenta will be expelled by the natural powers, after it has been retained much more than an hour; we may, therefore, consider ourselves justified in interfering to extract it, at the end of an hour or two after the child is born.

"It appears, then, to be a question of prudence or discretion, which every accoucheur must judge of in the individual case he is attending, whether to proceed to delivery at the end of the hour, or to wait another hour or two before he undertakes this operation. But, of course, this only applies to cases where there is no apparent danger." (*Synopsis*, page 153.)

"The time for interference of the accoucheur for the delivery of the placenta, should always be regulated by the condition of the uterus itself," says Dewees, "and that condition is whenever it is firmly contracted. Time, simply considered, can never form a safe rule for the delivery of the placenta; the *degree of contraction of the uterus* alone can point out the proper moment to operate, or teach us when it would be improper to attempt it. This rule, I believe, will never deceive, or at least I have uniformly acted upon this principle; and, so far, I think I am safe in saying, I have not had cause to believe it wrong." (*System of Midwifery*, page 447.)

As soon as the placenta is delivered, we must ascertain whether any portion of it, or of the membranes, has been left behind in the womb; but this is easily done by carefully examining the secundines. Should it happen that the membranes or after-birth are not extracted entire, it would be proper to pass the hand into the uterus, for the purpose of removing the remnants.

If a large quantity of the coagula that usually accompany the placenta remains in the womb, they may subsequently become a source of the after-pains yet to be described. Consequently, if there is reason to suspect the presence of large clots in the womb, the latter ought to be stimulated to contraction by repeated frictions over the hypogastrium. Some authors have even recommended the introduction of the hand into the uterine cavity, so as to rid it completely of all foreign bodies; the advice is good, but to be followed cautiously, because, on the one part, the uterus would be unnecessarily irritated, and on the other, it would not prevent the subsequent formation of fresh coagula.

We stated above, that usually in the course of fifteen, twenty, or twenty-five minutes after the birth of the child, the uterus, by contracting, notifies the accoucheur, as it were, of the proper moment for his intervention. It should always be remembered, however, that moderate tractions are all-sufficient for the delivery of the after-birth; and, if much resistance is met with, it would be far better to wait, and not make any new attempts, until the contractions shall have partly or completely overcome the obstacle.

Where there is the least reason to suspect the existence of a second child, after the birth of the first, the physician ought to satisfy himself on that point, both by an external and an internal exploration, before attempting to remove the placenta; and should a twin pregnancy be recognized by the great size of the womb, and more particularly by the vaginal examination, a ligature is to be applied immediately on the placental extremity of the cord belonging to the first infant; and the secundines are only to be extracted after the expulsion of both children. If, however, the placenta were detached, and presented at the orifice, he should attempt to extract it, more especially when it seems to obstruct the passage of the second fœtus. Nevertheless, such tractions ought to be exceedingly reserved; because, in compound pregnancies, there are frequent adhesions between the two placentas; and, if this were the case, it is evident that any forcible traction might detach the after-birth of the second child long before its expulsion; and this premature separation would render the mother liable to severe hemorrhage, and the child to fatal asphyxia.

After the birth of both children, so far from pulling on the two cords simultaneously, and moderately twisting them into one, it is more prudent to bring down the placentas, one after the other, giving the priority to the one which offers the least resistance. The mass of these conjoined bodies is made to engage in this way by one extremity; and it is thus enabled to clear the uterine orifice more readily.

In most cases of compound pregnancy the womb is excessively distended, and this distention, as we are all aware, is one of the circumstances that is most likely to enfeeble the contractility of its tissue; therefore the removal of the after-birth, after the labor is over, should not be accelerated too much, and the womb must be allowed a longer time than usual for its retraction; while moderate frictions are to be made over the fundus of the organ for the purpose of stimulating its action.

As regards the removal of the secundines after a miscarriage, we have nothing to add further than what will be stated in the article on *Abortion*.

CHAPTER VII.

OF THE NECESSARY ATTENTIONS TO THE WOMAN AND CHILD DURING LABOR.

ARTICLE I.

OF THE ATTENTIONS TO THE WOMAN DURING LABOR.

WHEN the accoucheur is summoned to a woman in labor, he should always provide himself with lancets, a female catheter, and the forceps; and, if in the country, he should have besides some ergot, either in grain or else freshly powdered, and one or two drachms of Sydenham's laudanum. His arrival ought always to be announced before entering the patient's chamber, for the emotion caused by a sudden entrance often proves sufficient to suspend the pains for a considerable time. Then, after having made the usual inquiries as to the time at which the pains began, their frequency, their duration and intensity, he might, if he supposes from this account the labor to be somewhat advanced, proceed at once to the vaginal exploration; in the contrary case, he may wait a few minutes, as well to satisfy himself of the value of the communications made by the attendants, as to give the woman time to prepare for the examination. When he finally judges this is necessary, he is to proceed with all possible decency, and always during the interval between the pains. The object of this is to endeavor to ascertain: 1, whether the woman is pregnant; 2, if she is in labor; 3, if she is at full term; 4, whether the membranes are ruptured; 5, whether the labor is far advanced; 6, what is the condition of the cervix, vagina, and perineum, and their degree of suppleness or resistance; 7, what is the conformation of the pelvis; 8, lastly, what part of the child presents.

At first sight, it may seem a ridiculous precaution to attempt to verify the existence of the pregnancy in a woman who declares she is actually suffering from the pains of childbirth; but, to say the least, this is not altogether useless, since it has unfortunately happened that some over-confident accoucheurs have been imposed upon by women who were themselves deceived as to the nature of the pains they felt; and we might quote many instances where, after having waited for the delivery to take place for several days, they have ultimately been constrained to acknowledge their mistake. Besides, this error is easily avoided by bearing in mind the diagnostic signs pointed out in the article on Pregnancy.

After observing the progress of the pains for some instants, he should next endeavor to ascertain their cause and nature, in order to favor those which have a bearing on the labor, and to combat any that are foreign thereto. Women are not unfrequently tormented by pains during the latter stages of gestation, which are dependent on some sympathetic disorder of the intestines, or abdominal organs, and which even a physician might mistake for the commencement of labor; these have been denominated the *false pains*, by way of distinguishing them from those produced by the contraction of the womb. The true and the false pains may be recognized by the following characters: the latter are ordinarily seated in the region occupied by the diseased organ, while those occasioned by the commencement of the travail usually begin about the umbilicus and loins, and die away at the perineum, the anus, or the sexual parts; the false are almost continuous, and their intensity is nearly uniform; the others, on the contrary, are intermittent. If the irregularity in the return and progression of the pains be such as to leave any doubt as to their character, he should interrogate the neighboring organs, and by a little attention he will succeed in determining their seat and nature. There are, however, certain pains which have their seat in the uterus itself, affect a certain degree of regularity, and simulate a true labor, which are dependent on a plethoric condition of the organ, that may be calmed by rest, a restricted diet, and blood-letting. Further, the epoch at which they occur, and the absence of the other phenomena of labor, will serve to lessen the difficulties in determining the diagnosis; nevertheless, it is the touch alone that can dispel all doubts; for the hardness that comes on in the uterine globe, the rigidity in the circumference of the os uteri, the tension and protrusion of the membranes during the pain itself, together with the retreat and relaxation of all these parts in proportion as it diminishes, characterize the pains of childbirth in an infallible manner.

"By examining," says Wigand, "the course of the true contractions, it will be found that they commence at the cervix, and pass to the fibres of the fundus, which are then thrown into action; and hence all contractions that begin in this latter part of the womb are anomalous, and result either from some disorder having occurred in the uterine forces, or else they are produced by an inflammation, or a disturbance in the functions of a neighboring organ." When the true pain is manifested, the head, which reposed during the interval on the cervix, sometimes mounts up even beyond the reach of the finger, but the membranes engage more or less in the orifice. In the course of a few seconds, the contraction extends all over the uterus, and more particularly to the fibres of the fundus; and the head, which was at first elevated, is forcibly pressed down on the neck, thus assuming the office of a wedge for hastening its dilatation; and, as a general rule, it is only when the fundus contracts in this manner, that the woman complains of pain. We may, therefore, consider the true pain as constituted of a series of phenomena, which succeed each other in the following order: first, the periphery of the cervix becomes tense; then, the presenting part ascends, and the membranes bulge out; next, the remainder of the uterus, the fundus especially, becomes hard, during which the patient complains of a sharp pain; and, lastly, the part that presented endeavors anew to engage. It is unnecessary to add, that the rapidity with which these phenomena succeed each other necessarily varies according to the individual, to the irregularities to which the process is subject, and according to the stage of the labor. Other things being equal, the contractions will effect the dilatation so much the sooner, in proportion as the cervix shall correspond more directly to the fundus of the organ, and the uterine axis shall be the more parallel to that of the pelvis.

After having learned the true character of the pains, the accoucheur next endeavors to ascertain whether the woman is really at term, so as not to encourage a premature labor, which might often be prevented if he knew its cause. He ought, therefore, to recall the various signs, by means of which we have attempted to characterize the different periods of pregnancy. Thus, should he find that the cervix is not yet entirely effaced, that it still retains a certain degree of length, that it is hard and resistant even during the interval of the contractions; that the latter are much less regular in their course, duration, and return, than in parturition at full term; and the belly not yet sunk down; he may justly conclude that the patient has not yet reached the end of the ninth month; also, that such a premature labor is owing either to some acute moral emotion, or some antecedent external violence. In all cases, he ought to attempt the arrest of this premature or false labor, by rest, both of body and mind, by venesection, if the woman's general condition will admit of it, and, more especially, by the administration of laudanum in full doses, taking care to empty the bladder when necessary, and to keep the bowels free by mild laxatives.

The use of means to stop the premature labor ought not to be given up, even though the cervix be entirely effaced, the orifice somewhat dilated, and a certain amount of water discharged; inasmuch as the escaped fluid might proceed from a hydrorrhœa and not from within the amnios, whilst premature pains can sometimes be calmed and the pregnancy enabled to proceed to full term.

Very conclusive observations on this point were published in 1857 by Dr. Charrier: he cited cases in which the dilatation equalled a quarter of a dollar in size, and in which the pains were suspended notwithstanding the membranes were engaged in and projecting from the orifice. The cervix afterwards closed in such a way as to reproduce its external orifice, and to present the conical shape which it has in the eighth month of gestation. This phenomenon, styled by M. Charrier, *retrocession of labor*, though doubtless rare, need only be possible in order to encourage the practitioner to suspend the labor whenever he is sure the membranes are intact, the child alive, and the woman not at term.

However, there is one phenomenon, sometimes manifested in the latter weeks of gestation, which may place the most skilful practitioner at fault. I allude to what has been designated as the *false labor*, in which certain women, after having nearly reached their full term, experience the true contractions; the pains are regular, the membranes bulge out, and the os uteri dilates; at times, these pains last from four to six hours, but then they disappear all at once, and everything goes on as usual. In others, the false labor is kept up at first during several hours, and then it passes off, returning in this manner every day, particularly towards the evening, and lasting one or two weeks. (See *Uterine Rheumatism.*)

When the accoucheur is very sure that the woman is really in labor, his attention must be directed to the frequency and the intensity of the pains, and to the dilatation, the hardness, and thinness of the cervix, in order to judge of its probable duration. During the same exploration, he should ascertain the conformation of the pelvis, particularly if the woman happens to be in her first confinement, and if any apparent deformities exist; he should also learn the situation of the orifice, the obliquity of the body and neck of the womb, and the child's presenting part. (See *Mechanism of Labor.*) If this latter is so high up as to render the diagnosis of the presentation difficult, its examination should be deferred until a more advanced period of the labor; but the bag of waters is never to be ruptured, in any case, for the mere purpose of rendering this examination more easy, before the entire dilatation of the neck; for such an untimely rupture of the membranes would be attended by very great inconveniences, if the position were at all defective; for, all the waters escaping, the fœtus might suffer from the pressure exercised directly upon it by the uterine walls; the umbilical cord would be compressed; and the womb, irritated by the prolonged contact of the fœtal inequalities, might be affected with spasmodic contractions; and, finally, the intervention of art becoming necessary, long after the evacuation of the waters, the necessary manipulations would be attended with much greater difficulties.

But it is not always so easy a matter as one might imagine to ascertain whether the membranes are ruptured or are still intact; for instance, where the vaginal examination is resorted to between the pains, in a vertex presentation, they are often applied so directly to the scalp that it is impossible to distinguish them. A pain should then be waited for, because, as soon as the uterus contracts, it drives the waters towards the lower parts, and the finger is observed to be raised up by a small quantity of this fluid that insinuates itself between the head and the amniotic sac, the integrity of which latter is thereby easily verified; but where the head is more deeply engaged, this afflux of liquid is very inconsiderable, and the tension of the membranes can scarcely be distinguished. Consequently, attention should be given to the state of the tumor both during and after the contraction. Where the waters have escaped, and the finger comes directly upon the child's cranium, it will detect the hairy scalp puckering up while the pain lasts, and becoming smooth and even as soon as it shall have ceased; though the contrary will take place when the membranes are intact, for they are never more smooth or more tense than during the contraction itself.

It is difficult at times to reach the cervix uteri in the commencement of the labor, because it is then carried so far backwards that the plane of its orifice actually looks towards the anterior face of the sacrum. I have often seen young practitioners who were unable to get at it at all, and others, who, not finding the os uteri, and distinctly feeling the child's head through the anterior inferior part of the womb, which is then rendered very thin by the distention it has undergone, have imagined that the dilatation was already completed, whereas it had hardly commenced; the disastrous consequences to which such an error might lead, can be readily imagined. In fact, it is very often necessary to pass the finger around the convex tumor which fills the excavation, in order to get the index far enough upwards and backwards, where the uterine orifice is to be found.

All these questions being determined, the accoucheur's attention should be directed early in the progress of the confinement to having the woman moved into the most suitable place. The chamber intended for her lying-in should be spacious, airy, well lighted, and retired; the air she respires ought

to be pure and of a moderate temperature, and all strong odors
good or bad, should be excluded. A temperature too elevated wi
pose her to nervous agitation, and to hemorrhagic accidents; an
other hand, the impression of cold is a very frequent cause of acu
mation, or of chronic engorgements, such as those that often com
delivery, which have for so long a time been attributed to lacte
tasis. But few persons are to be admitted in the chamber, and
especially, whose presence is at all unpleasant to her, ought to
excluded. This latter point demands the greatest care on the p
physician, for it is he alone who has authority thus to dismiss su
may think useless or injurious, and he must judge, from the recept
to each, of the pleasure or otherwise the patient experiences from
sence. Some women are almost ashamed of being delivered in the
of the husband; with others, on the contrary, it is one of the gre
solations to have him near them, and the accoucheur must endeav
cover all the little shades of delicacy and feeling, to sound, by dis
artful questions, a wish that the woman herself at times fears to
and, after having once learned it, he should religiously comply wi
a general rule, the mother and sister, or two intimate friends of th
besides the nurse, are the only ones that are to be allowed to st
room. With regard to dress, her garments should be full, suffic
as neither to incommode her movements nor her respiration.

If some time has elapsed since she has had a passage from the
simple injection must be given; and where this does not prove su
procure a stool, a second is to be immediately administered with
tion of one or two ounces of the *miel mercuriale*.[1] The evacuatio
matters contained in the rectum is the more necessary, as its d
might subsequently retard the escape of the head, and likewise pre
of the intestinal gases, whose accumulation might bring on colic
ings; besides, this precaution has the advantage of sparing the w
shame and disgust which an involuntary expulsion of the fæces d
last moments of labor would necessarily cause, as also of preve
accoucheur's hand from being soiled, while it supports the perineu

The accumulation of urine in the bladder ought likewise to be p
by persuading the patient to urinate in the very commencement of
turition; for, where she has not observed this precaution, or the
arrives too late to insist upon it, the emission of water becomes
more difficult, and sometimes quite impossible, owing to the con
which the head, engaged at the superior strait, makes on the ne
bladder. In such cases, he should endeavor to push the head up
by two fingers, so that she can urinate; and if this does not suc
catheter must be resorted to. We have elsewhere stated that it w
able, under such circumstances, to use a male catheter, the curv
which is greater; though, even by taking this precaution, a con
resistance is occasionally experienced to its introduction. This

---

[1] This preparation is only used as an injection; it is prepared by taking e
of clarified honey and the juice of the *mercurialis annua*, a plant belonging t
of the Euphorbiaceæ, and reducing them to the consistency of a syrup.—*Tr*

requires the most careful manipulation; the woman must lie flat on her back, and then, with one hand the womb is pressed backwards from the strait, or what is preferable, while the head, which by its presence in the lesser pelvis compresses the urethra, is raised by two fingers in the vagina, the other introduces the instrument into the urethra.

The accumulation of urine is attended with such grave consequences as to warrant a persevering effort to introduce the catheter. The least of all the accidents which may result therefrom, is a relaxation, or even the total cessation of the pains; for the distressing sensation caused by a distention of this organ, which is increased when the abdominal muscles contract, induces the woman to suspend the contractions as much as possible; besides which, the pain itself is sometimes so acute as to paralyze, as it were, the action of these muscles; and again, as they are separated from the uterine walls by the mass of urine shut up in the bladder, their action is transmitted to the womb in but a very feeble manner. The paralysis of the bladder, so often met with after labor, is a common consequence of prolonged retention of the urine; and finally, the walls of this reservoir are occasionally ruptured just at the moment when the woman gives way to the most violent bearing-down. Doubtless this last accident is rare, but still it is not without example, since Ramsbotham, Sen., has observed two cases of the kind. (*Obs. Pract.*, cases 89, 90.)[1] The tumor thus formed by the over-distended organ may easily be recognized, more particularly after the rupture of the membranes, by the soft, fluctuating tumefaction detected immediately above the pubis, extending at times nearly as high as the umbilicus, at the side of, and behind which, the hard resistant mass constituted by the uterus can be distinguished, whose consistence varies according to whether the examination is made during or after pain.

He should also attend early to having everything prepared that may be wanted somewhat later; thus, the thread intended for the ligature of the cord is to be laid out, and the band and linen for covering the child's navel are to be cut; for the mother, he ought to procure some cold iced water, vinegars, and smelling-salts, agents that will probably be unnecessary, but which, notwithstanding, he ought always to have at hand; and, lastly, he must direct the preparation of the bed upon which the woman is to be delivered. This bed (called the lying-in bed, the bed of misery, or the little bed) is arranged in the following manner: one with a sacking-bottom is procured, of a moderate height, and about two feet to two and a half in width, and one end of it is placed against the wall, being careful to keep it clear on both sides, so that one can pass freely all around it. A first mattress is placed on the bottom, and upon this a second, which covers its upper part, and is folded double towards its superior third, in such a way as to leave the first one uncovered about the foot. An oil-cloth, then a sheet, some pillows, and a coverlet, complete the furniture of the bed. A solid bar is placed transversely across the foot of the bed, so as to give the woman's feet a solid point of resistance in the last moments of her labor. In France, the patient is so placed that the upper part of her back rests on the inclined plane formed by the second mattress, and her breech at the margin of the same mattress; the inferior extremities are slightly flexed, and the feet press against the transverse bar placed at the foot of the bed. In England, women are delivered on the edge of their beds; they lie on the left side, having their legs and thighs flexed, and their knees separated by pillows. In Germany, the lying-in chair of the ancients is used; the patient is placed on an inclined plane, which can be modified at will, by lowering or raising the back, by means of a rack; the woman then draws on the arms of the chair, and presses her feet against the rounds with which it is supplied, and, as she gives way to the throes of labor, the sexual parts are uncovered, and correspond to the opening made in the edge of the seat. But, on the whole, the bed, furnished as we have described, appears preferable, the more so, because it is always at hand; and, as suggested by Desormeaux, it is particularly suitable where the woman must remain recumbent during the whole progress of labor, as is necessary whenever she is affected with hernia, or is threatened with hemorrhage, prolapsus, or a displacement of the womb. In case of necessity, its place might be supplied by a table and a few chairs placed against the wall. It would be much better, say Desormeaux and M. P. Dubois, where the family are in easy circumstances, to make use of an ordinary bed, taking care, however, to supply it with a rather hard mattress, and a hard cushion near the buttocks, to prevent the pelvic region from sinking down into the substance of the mattress, and the borders of the hole thereby produced, from forming an obstacle to the extension of the coccyx, or the escape of the child's head. On this bed, the woman is more at ease; she can lie on her side, or take the most convenient attitudes, and even sleep during the intervals of the pains; and then, after the delivery, she may remain there some time before being transported to another.

---

[1] The symptoms of this accident are very similar to those of a rupture of the womb, excepting that the child remains *in situ*. There is, besides, a sudden and sharp pain in the vesical region, and the patient complains of the sensation caused by the effusion of the liquid into the abdominal cavity, syncope, &c. The signs peculiar to the vesical rupture are the collapse and disappearance of the tumor previously formed by the bladder (which could be felt above the pubis), and an obscure fluctuation in the belly.

Ought the accoucheur to remain constantly with the patient? This is a question whose solution varies according to the character of the female herself, and the greater or less intimacy existing between her and her physician, for there are some timid women who desire to have him always close at hand, and others again, who are impatient and annoyed by his continual presence. But in all cases, he should bear in mind that, during parturition, the patient very often wishes to urinate or to empty her bowels, and he ought, therefore, to go from time to time into an adjoining chamber, in order to give her the desired opportunity. Again, during the labor, a wife is frequently cheered up by the caresses and consolations bestowed by her husband; the physician will understand that his presence at such times must act as a restraint, and he should discreetly withdraw, or, at least, not observe what is going on. Further, he may absent himself more frequently during the period of the dilatation; for instance, after having made the examination, and ascertained that the child's presentation and position are both favorable, he might, if the cervix was just beginning to dilate, attend to his other occupations, and return again in the course of a couple of hours; but if the diagnosis of the position had been impossible, or if the latter had proved to be an unfavorable one, he must not quit her under any pretext, in order to be always ready to ward off any accidents which might subsequently demand his intervention. When the stage of expulsion commences, the accoucheur places himself at the right of the bed, on a chair of a suitable height. The part he has to perform consists, in a natural labor, in ascertaining its progress, from time to time, by the touch, in directing properly the bearing-down efforts of the patient, and in sustaining the perineum with his hand while the child's head is passing through the vulva.

During the first stage, the woman may lie down, sit down, or walk about, at her pleasure; indeed, this frequent change of position renders the slowness and fatigues of childbirth more supportable; but, at the end of this stage, when the dilatation is completed, and the amniotic sac projects strongly, and is on the point of yielding, she must then resume her bed; and this precaution is particularly indispensable in those who have already borne several children; because, in them, the expulsion of the fœtus sometimes follows so promptly after the rupture of the membranes, that the patient has not always the time to regain her bed, and is liable to be delivered standing. But when, after the rupture, the progress of the labor is slow, and the head is more or less engaged in the excavation, or has already descended as low as the perineum, but does not advance, and the pains seem to become more and more feeble and distant, it is advisable to recommend her to get up and walk about, having her supported by assistants, if her own strength does not permit her to walk alone, for it is found by experience that bodily motion seems to give more activity to the uterine contractions. In the contrary case, she must not leave the bed without some special indication. Where the patient is tormented by pains in the loins, we may relieve them by stretching a folded napkin under the small of the back, and directing two persons, placed at the opposite sides of the bed, to pull on the extremities of the towel during the pain. Attempts should be also made to assuage the cramps, so often experienced in the thighs and calves of the legs, by voluntary contraction of the antagonist muscles of the suffering ones, which will be far more effectual than frictions over the suffering parts.

Some nervous women are troubled with tremblings and chills, in the very commencement of their labor, which are at times sufficiently marked to cause much disquietude. Dewees observed that they often coincide with an unusual rapidity in the dilatation of the cervix, and he says: "A lady, who every moment expected her labor to commence, was awakened suddenly in the night by a violent chill. The nurse became alarmed, and I was immediately sent for. When I arrived, I found her still trembling very severely, but she had not experienced any symptoms of labor; she assured me that nothing was the matter with her except what I was witnessing, namely, an agitation of the whole body, which she could not, by any effort, control. In about five minutes, she cried out she believed her labor was coming on; and this really was the case, and so rapidly as not to give me time to place her in a proper situation for delivery; she was delivered in less than five minutes from the time she first called my attention to her. These shiverings are sometimes renewed during or immediately after the labor, but in no case do they merit a serious attention."

Patients are often frightened at the time the bag of waters is torn, and it is therefore a good plan to advise them of it beforehand; and the precaution should also be taken of placing a sponge or some old linen near the genital parts, so as to receive the liquids as they escape. Immediately after the discharge of the waters, it is advisable for the practitioner to assure himself anew of the presentation and position, lest he might have been deceived in the first examination.

The rupture of the membranes generally takes place spontaneously, but this is not always the case, and the accoucheur must sometimes interfere. It is very certain that when the uterine orifice is entirely dilated, when the membranes are forced into the vagina by a large quantity of fluid, and the head is movable, but still the contractions do not produce a spontaneous rupture of the membranes,—it is evident, we repeat, that they, by their resistance, prolong the labor. Although this obstacle is never insurmountable, by the efforts of nature alone, yet the delay in the delivery and the dragging on the membranes may be attended with some inconveniences, and it is therefore better to lacerate them. This is done by taking advantage of a strong contraction, and, while they are greatly distended, forcibly pressing the index finger against the centre of the tumor.

When this rough pressure is not sufficient, we scratch the membranes with the finger-nail; and by gradually weakening the three tunics, succeed in rupturing them. Sometimes, however, they still resist, and then some instrument, such as a blunt probe, or, still better, the end of a quill cut down, is directed up to them along the finger. M. Dubois made for the same purpose a very convenient instrument, consisting merely of a piece of whalebone sharpened at one end. Where the waters are *flat*, that is, when but little liquid intervenes between the membranes and the head, some care is requisite, in using the little instrument, to direct it obliquely, so as not to wound the fœtus with its point. Rupturing the membranes is, therefore, a trifling operation; still, excepting in some rather rare cases to be spoken of hereafter, it ought not to be performed until after the orifice is thoroughly dilated. Whatever the presenting part may be, there is always an advantage in retaining a large amount of fluid in the uterus.

Some peculiar circumstances may, however, demand the artificial rupture before the dilatation is completely effected.

In a case reported by Baudelocque, the child was so movable, that it successively presented every part of the surface of its body at the os uteri. In a woman whose belly was distended by a great quantity of water, M. Martin, of Lyons, had recognized the feet and one hand through the membranes. "I then felt disposed," says he, "to terminate the labor, when, at the request of her husband, I called a friend in consultation; but on touching her again, before his arrival, I detected the head where I had previously found the feet and hand, when I immediately punctured the membranes, whereby the head was fixed at the superior strait and the delivery rendered natural." (*Comptes Rendus*, p. 155.) Should a case of this nature be met with, the rule we have just given might be laid aside, and the membranes be ruptured, however inconsiderable the dilatation. It is scarcely necessary to add that an artificial rupture is only to be resorted to when the fœtus shall be detected presenting by its cephalic extremity; for then the discharge of a certain quantity of the amniotic liquid, and the retraction of the uterus, will irrevocably fix this part at the upper strait.

Again, according to the majority of writers, the membranes may be lacerated before the entire dilatation of the cervix, where there is reason to suppose that the waters, from their too great abundance, distend beyond measure, and thus weaken the contraction of the uterine walls; but, even here, Gardien recommends the greatest circumspection, and advises the previous employment of all the measures calculated to stimulate the contraction of the womb.

Finally, we shall learn hereafter that the puncture of the ovum at an early period of labor, is one of the most effectual means of arresting certain dangerous hemorrhages which may supervene during its progress.

The finger ought to be introduced into the vagina several times in the course of the last stage of labor, both during the pains and in the interval between them, to ascertain the progress of the head in the excavation. Nevertheless, this exploration is to be resorted to as rarely as possible, and only when the interest of the mother seems to demand it.

Most women, supposing that they can materially hasten the termination of the labor by making the most of their pains, contract their muscles, bear down violently, and make extraordinary efforts at the beginning; but these uselessly exhaust their strength; for, so long as the neck is ineffaced, and the bag of waters unbroken, all bearing-down effort is fruitless. But in the second stage, where the head descends into the excavation and rests on the perineum, she should be encouraged to aid the uterine forces by a voluntary contraction of the muscles of the trunk and limbs; though, as soon as the pain has passed off, all the auxiliary efforts should be at once suspended. Again, in the latter moments of the travail, just when the head is about to clear the vulva, the pains are so sharp that the woman naturally gives way to incredible exertions, which may possibly occasion serious accidents; hence all the powers of persuasion should then be employed to induce her to moderate her strainings.

During the last moments of childbirth, the pressure of the head on the lower part of the rectum creates an urgent desire of emptying the bowels; and many women, yielding to a misunderstood modesty, then wish to rise and retire to the closet; but it would be exceedingly imprudent to comply with their demand, and they must not leave the bed under any pretext whatever. In the first place, this desire is often illusory, more especially where the precaution has been taken to empty the intestine at the commencement of labor; and then it may happen, as I once witnessed, that the patient, surprised by a violent pain, is delivered on the close stool, without the physician being able in any way to render her the necessary attentions.

It is in these last moments that the accoucheur must give all his attention to supporting the perineum, which is done by pressing the whole perineal surface equally, and with a moderate degree of force, by the palmar face of the hand. The latter is applied in such a way as to make the radial

ARTICLE II.

OF THE ATTENTIONS TO THE CHILD DURING LABOR.

Having determined the presentation and position, the accoucheur should next ascertain whether the child is living or dead, as it is highly important to determine this point, in order to diminish his own responsibility, by advising the family of the fact.

Before the membranes are ruptured, the diagnosis may be easily made out by ascertaining through auscultation the existence or absence of the pulsations of the fœtal heart, as also the continuance or complete cessation of the active movements, in regard to which the woman can always give sufficiently accurate information. After the rupture of the membranes, the active movements are feeble, and sometimes entirely absent; in which case, however, the pulsations are still detected by auscultation.

The touch also reveals certain signs which may shed still further light upon the question. Thus, when the child is alive and the head presenting, it often becomes affected with a sanguineous swelling, the size of which depends upon the length of time which has elapsed since the discharge of the waters. This tumor does not form when the child has ceased to live; and if its death dates back for several days, the resisting tumor formed by the sero-sanguineous infiltration will be replaced by a soft, flaccid, and wrinkled condition of the hairy scalp. Besides this, the bones of the cranium will be more movable, and the overriding of their edges greater than usual; a sort of crepitation is also produced by their rubbing against each other. A more embarrassing case is that in which the child dies some time after the rupture of the membranes, but not before the sanguineous tumor has had time to be developed. Even here the uncertainty will be of short duration, for, provided the labor should continue beyond three or four hours, the tumor will lose its consistency, and its softness and flaccidity render a mistake a matter of difficulty.

Finally, when the pelvis is rather contracted, the wrinkling of the scalp may simulate a swelling, whose diagnostic importance it is well to appreciate. In this case, says Merriman, the best means of judging of the life or death of the child by the tumor of the scalp is as follows: when living, it is observed that, at the moment when the head is strongly urged down by the contraction of the womb, the bones overlap each other, and, as a consequence, the scalp becomes folded, and thus constitutes a temporary tumor; but immediately after the pain is over, the head regains its primitive form, by the expansion of the cranial bones, and the folds and tumefaction previously exhibited by the skin disappear, or, at least, considerably diminish. On the contrary, however, if it be dead, the expansibility of the bones is destroyed, and the head does not reassume its primitive form and volume after the contraction has passed off; wherefore the tumor formed by the doubling of the hairy scalp still persists, in a great measure. Now, in this condition of affairs, the swelling is sometimes greatly augmented by the liquids forced in by the pressure from above, and whenever, in such cases, a perforation of the cranium has to be resorted to, practitioners well know there is half an inch at least of soft parts to be traversed before reaching the bone. (Merriman's Synopsis.)

If the face should present, the softness of the lips, and the flaccidity and immobility of the tongue, should lead us to suspect that the child is dead; since, when living, the firmness of all its parts, and the motion of the tongue, are often felt with ease.

In breech presentations, the introduction of the finger into the anus will detect a resistance and contractile power on the part of the sphincter if the child be living, which will be absent if the child be dead.

Lastly, in shoulder and arm presentations, the swelling of the member, and its violet hue, will afford an indication in favor of its life.

Should the cord hang in the vagina, its softness, withered condition, and the absence of pulsation in the umbilical arteries, would justify a belief that the child was dead.

A thick and fetid condition of the amniotic fluid, and a discharge of meconium, have been regarded as indicating the death of the child. The altered condition of the waters is of no great importance, since it has sometimes been found to coincide with perfect integrity of the fœtal life, but the discharge of meconium is of greater significance.

It is not at all uncommon to find the meconium escaping in greater or less quantity during parturition; and, as previously stated, this peculiarity most frequently occurs in the positions of the pelvic extremity, and is then of little consequence; but this does not hold good in any other presentation; for then its discharge is always an unfavorable sign, one calculated to arouse the anxious solicitude of the medical attendant, as it usually indicates a state of suffering on the part of the child, which is almost always due to a compression of the cord. It must be apparent, on the least reflection upon the part performed by the placenta during the intra-uterine life, that an interruption of the fœto-placental circulation produces asphyxia, which latter determines a cerebral congestion, and sometimes even an apoplectic effusion, whence a paralysis of the sphincter ani results. Now, if to this palsy of the sphincters, we add the instinctive acts of respiration[1] made by the fœtus, which are the more violent as they are the more ineffectual, we can understand without difficulty how an escape of the meconium may result from a compression of the cord.

As regards the prognosis, it is important to observe the precise moment at which this discharge takes place, as it is always serious when it does not occur till some time after the rupture of the membranes; though the waters, when they escape, are often colored yellow, and the presence of the meconium then is not necessarily an alarming symptom. In some cases, it may indeed indicate an actual compression of the cord; but it may also result from a compression that had existed some time before birth, which may have compromised the child's life for a few moments, and then have suddenly disappeared in consequence of some brisk movement of the infant.

It is not difficult to conceive that the cord might undergo a momentary compression during the last months of gestation, as also that it might be displaced by a sudden motion of the child, and the fœto-placental circulation be re-established in consequence. Now, this compression may have lasted so long as to threaten asphyxia, and consequently to produce a discharge of meconium.

---

[1] Mayer has observed respiratory movements in embryos, even within the ovum, as soon as he compressed the cord.

Endeavors have been made to determine by the physical characters of the meconium, whether its discharge was occasioned by a presentation of the breech, or by the sufferings of the fœtus. It has been said that, in the latter case, the meconium is very fetid, thinner, and more diluted, than when the breech is above the uterine orifice. Such signs, however, are very inconclusive.

On the whole, therefore, a discharge of meconium in breech presentations is of little consequence; but, in the other presentations, and where occurring some time after the rupture of the membranes, it is always an unfavorable sign; though, to judge of its value at the time of the rupture itself, recourse must be had to auscultation.

Of all these signs, the best undoubtedly is that supplied by auscultation of the heart, whose pulsations are always perceptible if the child be living. It is quite possible for the pulsations of the cord to escape detection even though the fœtus be living, inasmuch as they sometimes stop during the pain and begin again when it is over. Therefore, certainty of diagnosis would require that the pulsations should have ceased for a considerable time, ten or fifteen minutes at the least.

In vertex presentations, as soon as the head is expelled its disengagement is effected.

Immediately after its expulsion, the disengagement of the head is completed, either by carrying it more and more towards the pubis, or by insinuating the index upon one side of the lower jaw; this being accomplished, we must next ascertain whether the cord does not make one or more turns around the neck, and if so, gentle tractions must be made on its placental extremity, to avoid its being dragged upon, and to prevent strangulation of the fœtus, &c.; and when a sufficient extent of it cannot be brought out, to render the prevention of such accidents certain, we have to cut it, and terminate the labor as promptly as possible, by hooking one or the other shoulder with the forefinger.[1] After the head is born, the womb, exhausted by its last efforts, remains passive for some instants, and it frequently happens that the child begins to respire and cry, even before the delivery of the chest. We may, therefore, wait patiently until the contraction is renewed, simply supporting the head, lest the mouth and nose be choked up by the cloths or blood found between the woman's thighs; but if the atony is prolonged, and more especially if the face of the new-born infant is observed to be red and tumefied, as sometimes happens after painful labors, the remainder of the travail ought not to be left entirely to nature, but new pains should be at once solicited by frictions over the abdominal walls, and the patient be encouraged to bear down. The disengagement can almost always be accomplished by moderate tractions upon the head grasped

---

[1] These folds may occasionally be drawn so tightly as to strangle and kill the infant, as occurred in the following case: "Upon approaching a woman who had just been delivered, I found the child dead, and still lying near the genital parts; the cord made three turns around its neck, and they were so firmly tightened that a deep ecchymosis was seen on this part." (Guillemot.)

If the face should present, the softness of the lips, and th
immobility of the tongue, should lead us to suspect that th
since, when living, the firmness of all its parts, and the moti
are often felt with ease.

In breech presentations, the introduction of the finger in
detect a resistance and contractile power on the part of the
child be living, which will be absent if the child be dead.

Lastly, in shoulder and arm presentations, the swelling
and its violet hue, will afford an indication in favor of its

Should the cord hang in the vagina, its softness, withere
the absence of pulsation in the umbilical arteries, would
that the child was dead.

A thick and fetid condition of the amniotic fluid, and
meconium, have been regarded as indicating the death of
altered condition of the waters is of no great importance, si
times been found to coincide with perfect integrity of the fœ
discharge of meconium is of greater significance.

It is not at all uncommon to find the meconium escaping
less quantity during parturition; and, as previously stated,
most frequently occurs in the positions of the pelvic extremi
of little consequence; but this does not hold good in any othe
for then its discharge is always an unfavorable sign, one
arouse the anxious solicitude of the medical attendant, as
cates a state of suffering on the part of the child, which is
due to a compression of the cord. It must be apparent, on
tion upon the part performed by the placenta during the in
that an interruption of the fœto-placental circulation prod
which latter determines a cerebral congestion, and some
apoplectic effusion, whence a paralysis of the sphincter ani
if to this palsy of the sphincters, we add the instinctive acts
made by the fœtus, which are the more violent as they are th
tual, we can understand without difficulty how an escape of
may result from a compression of the cord.

As regards the prognosis, it is important to observe the
at which this discharge takes place, as it is always serious w
occur till some time after the rupture of the membranes; tho
when they escape, are often colored yellow, and the presenc
nium then is not necessarily an alarming symptom. In som
indeed indicate an actual compression of the cord; but it
from a compression that had existed some time before bir
have compromised the child's life for a few moments, and t
denly disappeared in consequence of some brisk movement of

It is not difficult to conceive that the cord might undergo
compression during the last months of gestation, as also th
displaced by a sudden motion of the child, and the fœto-pla
tion be re-established in consequence. Now, this compress

---

[1] Mayer has observed respiratory movements in embryos, even wit
soon as he compressed the cord.

ce at al
novemen
and tha
e face i
ubic arch,
pressure
tage, may
ongestion.
the peri-
upon this
k.
ntirely to
e already
hesitate to
l labor by
and some-
t tractions,
expulsion
lifficulty in
sole agent
the circular
is strongly
remities are
ne chest, the
gether; but,
the trunk,
the margins
participate in
of the head;
nd supporting
aking care, as
ndition of the
as the navel,
ertion, he joins
placental ex-
gged upon, and
infant's thighs;
nlarged by pull-
t from the poste-
s, with soft parts
less dangerous to
sis pubis; but if
, and have a liga-
be terminated as

the fœtus always
head are expelled,
ord is compressed,

by both hands; and if these measures prove insufficient, the index finger, curved like a hook, is to be placed in one of the armpits, and the disengagement of the anterior shoulder thereby first effected.

After the shoulders are disengaged, the spontaneous expulsion of the breech and lower extremities may also be delayed in consequence of inactivity of the womb. Here again, it is especially proper to endeavor to excite the contractions by frictions upon the abdomen; but should the life of the fœtus appear to be in danger, the extraction should be effected immediately.

The artificial extraction of the shoulders or of the lower part of the trunk, we see, ought not to be resorted to until expectation might become dangerous to the fœtus. When the expulsion is left entirely to nature, the womb contracts in proportion as it is emptied, and there is less cause to fear the consecutive inertia which is sometimes produced by too rapid an extraction.

In those rare cases, where the occiput remains posteriorly until the end of labor, most accoucheurs have recommended that an attempt should be made to bring it round to the front, but we doubt whether this will often prove successful, although we have never seen it tried, nor ever attempted it ourselves; for we believe that where the process of rotation does not take place spontaneously, all efforts to produce it artificially would be useless, not to say injurious. Nevertheless, most authors advise, when the head has descended into the excavation, immediately after the discharge of the waters, to make it deviate either towards the right or the left in the *interval between the contractions* (Velpeau), by slipping two or three fingers either along the sacrum, to press the occiput forward, or else upon the side of the forehead, behind the pubis, to carry it backward. If we should ever entertain the thought of attempting this manœuvre, we would much prefer acting during the contraction, for then we should only aid, without absolutely supplanting nature; we would prefer, whilst acting upon the occiput, as indicated by Velpeau, applying, at the same time, two fingers on the temples, and acting thereupon in such a way as to turn the forehead posteriorly. But, we repeat, this appears unnecessary in the great majority of cases, because it only hastens the process of rotation, which would have subsequently taken place without it; and even hurtful in others, for the efforts used to bring it about might exert a pernicious influence both on the mother and her child.

In fact, in ordinary cases, where the rotation is produced by the natural powers, the trunk follows the movements of the head; but where the latter has been turned by the fingers, the body remains immovable, and hence the process of forced rotation may dislocate the atloido-axoid articulation and kill the child.

The older accoucheurs thought that a spontaneous delivery, in face presentations, was altogether impossible, and consequently they advised an endeavor to be made, in the very outset of labor, to convert them into vertex positions; but we of the present day understand better the value of such opinions. However, the rotation by which the chin is brought under the symphysis pubis, whatever might have been its primitive relation to the superior strait (see *Mechanism of Delivery by the Face*), is difficult, painful, and sometimes, in the mento-posterior positions, does not take place at all. It will be seen, further on, that the non-accomplishment of this movement forms one of the most serious complications met with in practice, and that craniotomy often becomes necessary in consequence. When the face is engaged at the inferior strait, and the chin is found under the pubic arch, the movement of flexion begins, and then, as has been shown, the pressure to which the vessels of the neck are subjected, during the fourth stage, may retard the circulation enough to determine death by cerebral congestion. Hence, we learn what great precaution is necessary in supporting the perineum, since it must be evident that too great a pressure made upon this part would necessarily augment the compression of the child's neck.

The delivery by the pelvic extremity ought to be abandoned entirely to nature, unless there are some unfortunate complications. We have already insisted upon this point in the note at page 354; but do not hesitate to repeat again the advice, not to resort to any traction in a natural labor by the breech, because, as there stated, a stretching out of the arms, and sometimes even an extension of the head, result from such imprudent tractions, whilst these complications are scarcely ever met with where the expulsion is left to the uterine contractions entirely. Now, there is no difficulty in comprehending these different results, for when the womb is the sole agent of the delivery of the child, the latter is forcibly urged on by the circular fibres at the superior part of the organ, and at the same time is strongly pressed on its sides by the longitudinal fibres. The upper extremities are therefore maintained against the lateral and anterior parts of the chest, the head is kept flexed on the thorax, and all these parts descend together; but, on the contrary, if any tractions are made, they only act on the trunk, which then descends alone, while the arms, being arrested by the margins of the cervix uteri, or by the periphery of the straits, do not participate in the descent, and are ultimately found placed against the sides of the head; hence, the accoucheur's exclusive duty consists in receiving and supporting the lower parts of the child as they become disengaged; taking care, as soon as the breech has cleared the vulva, to ascertain the condition of the cord. For that purpose, the forefinger is slipped up as far as the navel, when, if the cord is found to be tightened at its umbilical insertion, he joins the thumb to the index so as to produce some traction on its placental extremity only, with the view of preventing both its being dragged upon, and its possible laceration. The cord sometimes gets between the infant's thighs; and, in such cases also, the loop thereby formed must be enlarged by pulling on the placental extremity, and then by disengaging it from the posterior limb, bring it into contact with the perineum, that is, with soft parts whose compression will be less severe, and consequently less dangerous to the circulation than what it would suffer from the symphysis pubis; but if it is too short to be brought to the exterior, it must be cut, and have a ligature applied on its umbilical extremity, and the labor be terminated as rapidly as possible.

But, whatever may have been the cause, the death of the fœtus always results from the slowness with which the shoulders and head are expelled, for it is only during this last part of the travail that the cord is compressed, or that a separation of the placenta takes place; hence, although we have condemned all traction in general, it must be otherwise under such circumstances. But how is it possible to determine the period beyond which it would be imprudent to wait? We answer, that as soon as asphyxia comes on, the suffering condition of the child may easily be detected by examining the portion of the cord which has been delivered; and if the pulsations still maintain their intensity, their frequency and habitual regularity, the rest of the process may be abandoned without danger to the powers of nature; but, on the contrary, if they are found to relax, or even to become more rapid, though at the same time more feeble, thread-like, and especially if intermittent or irregular, every effort must be used to remove the fœtus from the danger which threatens it.

The signs furnished by the irregularity of the pulsations of the umbilical arteries, and to which great importance has been attributed by some authors, only become sensible after the asphyxia has lasted for so long a time that it is not always possible to overcome it; therefore we regard as much more available the phenomena next to be mentioned.

When the head alone remains behind in the pelvic excavation, the child is very often observed to dilate its chest actively, and make a violent inspiratory effort, which may be referred to a rapid convulsive contraction of the diaphragm and abdominal muscles, repeated at irregular intervals; now such acts never take place while the fœto-placental circulation remains intact, since the pulmonary respiration is unnecessary so long as the placental one is going on, and therefore these struggles constantly announce a state of suffering, or of imminent asphyxia, from which the infant must speedily be relieved. Where the head alone is undelivered, the patient must be encouraged to bear down strongly, so as to hasten the termination of her labor, and avoid a prolonged compression of the cord; and the accoucheur might facilitate the flexion of the head by gently carrying the trunk up in front of the symphysis, or when the flexion appears difficult, he may, by insinuating two fingers under the symphysis, press slightly on the occiput; for a comparatively light force exercised on the posterior part of the head is often sufficient to reverse the great occipito-mental diameter, and terminate the delivery. Should the head resist these efforts, other measures become necessary; but they belong to instrumental delivery, and we shall treat of them in the article on *Version*.

Finally, should it be impossible to extract the head immediately, we may endeavor to introduce the fore and middle fingers into the mouth of the child, and then separate them slightly, so as to leave an open space through which air might find its way to the mouth. The same object would be effected with still greater certainty, by introducing a large catheter into the mouth.

This book is the property of
COOPER MEDICAL COLLEG
SAN FRANCISCO, CAL.
and is not to be removed from the
Library Room by any person or
under any pretext whate

CHAPTER VIII.

OF THE ATTENTIONS TO THE WOMAN AND CHILD IMMEDIATELY AFTER DELIVERY.

ARTICLE I.

OF THE ATTENTIONS TO THE WOMAN IMMEDIATELY AFTER DELIVERY.

As soon as the child has been expelled, the accoucheur should place his hand upon the mother's abdomen in order to ascertain whether there is another child, as also to learn whether the uterus contracts well, inasmuch as inertia of the organ should lead to the anticipation of hemorrhage. It would also be right to determine whether there be too free a discharge of blood from the external parts.

The expulsion of the placenta and its annexes, whether spontaneous or assisted by the accoucheur, generally follows very shortly after the exit of the fœtus. In order to avoid separating the study of this natural delivery of the after-birth from that of the difficulties and dangers which may attend it, we shall treat of them separately. (See *Delivery of the After-birth.*)

After the delivery, the accoucheur should ascertain, both by the external examination and the vaginal touch, whether the placenta has drawn down or inverted the fundus of the womb, for the purpose of rectifying it at once if such an accident has occurred. If everything proves to be in its natural condition, frictions with the hand are to be made over the hypogastric region from time to time, in order to excite the retraction of the uterus, and thus favor its disengorgement, and the expulsion of the coagula which may be still contained there. The patient is allowed to remain for some minutes on the bed where she was delivered, so as to give her a little repose, as well as time to the uterus and vagina to clear themselves of the blood, which flows at first in abundance, and would soil the linen in which she is about to be enveloped. Besides, a few minutes are ordinarily devoted to paying those necessary attentions to the infant, hereafter pointed out. In fact, she might remain upon the same bed a still longer period, when the delivery has either been preceded or followed by syncope, hemorrhage, or any other accident, or even where there is reason to fear something of this nature, taking care, however, to substitute dry things for those that have been soiled. She ought to lie perfectly flat, the thighs stretched out alongside of each other, lightly covered, and be left in silence, and the most absolute rest of both body and mind. In about half an hour, the patient will again require special attention; the genital organs, and upper part of the thighs, are to be first washed carefully and gently with lukewarm water, pure or mixed with a little wine; then they are to be wiped with warm and well-dried towels, and all the garments worn during parturition that have been soiled by the perspiration, discharges, and fecal matters, are removed, and replaced by others, previously well dried and warmed; their shape is unimportant, the only point requisite is to have them large enough not to incommode the woman in any way, and to admit of being changed easily ings are sometimes renewed during or immediately after the labor, but in no case do they merit a serious attention."

Patients are often frightened at the time the bag of waters is torn, and it is therefore a good plan to advise them of it beforehand; and the precaution should also be taken of placing a sponge or some old linen near the genital parts, so as to receive the liquids as they escape. Immediately after the discharge of the waters, it is advisable for the practitioner to assure himself anew of the presentation and position, lest he might have been deceived in the first examination.

The rupture of the membranes generally takes place spontaneously, but this is not always the case, and the accoucheur must sometimes interfere. It is very certain that when the uterine orifice is entirely dilated, when the membranes are forced into the vagina by a large quantity of fluid, and the head is movable, but still the contractions do not produce a spontaneous rupture of the membranes,—it is evident, we repeat, that they, by their resistance, prolong the labor. Although this obstacle is never insurmountable, by the efforts of nature alone, yet the delay in the delivery and the dragging on the membranes may be attended with some inconveniences, and it is therefore better to lacerate them. This is done by taking advantage of a strong contraction, and, while they are greatly distended, forcibly pressing the index finger against the centre of the tumor.

When this rough pressure is not sufficient, we scratch the membranes with the finger-nail; and by gradually weakening the three tunics, succeed in rupturing them. Sometimes, however, they still resist, and then some instrument, such as a blunt probe, or, still better, the end of a quill cut down, is directed up to them along the finger. M. Dubois made for the same purpose a very convenient instrument, consisting merely of a piece of whalebone sharpened at one end. Where the waters are *flat*, that is, when but little liquid intervenes between the membranes and the head, some care is requisite, in using the little instrument, to direct it obliquely, so as not to wound the fœtus with its point. Rupturing the membranes is, therefore, a trifling operation; still, excepting in some rather rare cases to be spoken of hereafter, it ought not to be performed until after the orifice is thoroughly dilated. Whatever the presenting part may be, there is always an advantage in retaining a large amount of fluid in the uterus.

Some peculiar circumstances may, however, demand the artificial rupture before the dilatation is completely effected.

In a case reported by Baudelocque, the child was so movable, that it successively presented every part of the surface of its body at the os uteri. In a woman whose belly was distended by a great quantity of water, M. Martin, of Lyons, had recognized the feet and one hand through the membranes. "I then felt disposed," says he, "to terminate the labor, when, at the request of her husband, I called a friend in consultation; but on touching her again, before his arrival, I detected the head where I had previously found the feet and hand, when I immediately punctured the membranes, whereby the head was fixed at the superior strait and the delivery rendered natural." (*Comptes Rendus*, p. 155.) Should a case of this nature be met with, the rule we have just given might be laid aside, and the membranes be ruptured, however inconsiderable the dilatation. It is scarcely necessary to add that an artificial rupture is only to be resorted to when the fœtus shall be detected presenting by its cephalic extremity; for then the discharge of a certain quantity of the amniotic liquid, and the retraction of the uterus, will irrevocably fix this part at the upper strait.

Again, according to the majority of writers, the membranes may be lacerated before the entire dilatation of the cervix, where there is reason to suppose that the waters, from their too great abundance, distend beyond measure, and thus weaken the contraction of the uterine walls; but, even here, Gardien recommends the greatest circumspection, and advises the previous employment of all the measures calculated to stimulate the contraction of the womb.

Finally, we shall learn hereafter that the puncture of the ovum at an early period of labor, is one of the most effectual means of arresting certain dangerous hemorrhages which may supervene during its progress.

The finger ought to be introduced into the vagina several times in the course of the last stage of labor, both during the pains and in the interval between them, to ascertain the progress of the head in the excavation. Nevertheless, this exploration is to be resorted to as rarely as possible, and only when the interest of the mother seems to demand it.

Most women, supposing that they can materially hasten the termination of the labor by making the most of their pains, contract their muscles, bear down violently, and make extraordinary efforts at the beginning; but these uselessly exhaust their strength; for, so long as the neck is ineffaced, and the bag of waters unbroken, all bearing-down effort is fruitless. But in the second stage, where the head descends into the excavation and rests on the perineum, she should be encouraged to aid the uterine forces by a voluntary contraction of the muscles of the trunk and limbs; though, as soon as the pain has passed off, all the auxiliary efforts should be at once suspended. Again, in the latter moments of the travail, just when the head is about to clear the vulva, the pains are so sharp that the woman naturally gives way to incredible exertions, which may possibly occasion serious accidents; hence all the powers of persuasion should then be employed to induce her to moderate her strainings.

During the last moments of childbirth, the pressure of the head on the lower part of the rectum creates an urgent desire of emptying the bowels; and many women, yielding to a misunderstood modesty, then wish to rise and retire to the closet; but it would be exceedingly imprudent to comply with their demand, and they must not leave the bed under any pretext whatever. In the first place, this desire is often illusory, more especially where the precaution has been taken to empty the intestine at the commencement of labor; and then it may happen, as I once witnessed, that the patient, surprised by a violent pain, is delivered on the close stool, without the physician being able in any way to render her the necessary attentions.

It is in these last moments that the accoucheur must give all his attention to supporting the perineum, which is done by pressing the whole perineal surface equally, and with a moderate degree of force, by the palmar face of the hand. The latter is applied in such a way as to make the radial border of the index finger cover the anterior margin of the perineum, the ends of the fingers corresponding to the left side, and the thenar eminence of the palm to the right side of this partition, while the thumb is held to the right of the labia externa. The pressure should be somewhat greater near the anus, so as to give the fœtal head a forward direction, and facilitate its movement of extension.

Finally, whatever may be the child's position, we should, contrary to the opinion of certain authors, abstain from introducing the fingers into the lower part of the vagina, or making pressure on the perineum and coccyx; in a word, from performing what they call their *little labor*. There are, however, a few measures which may be useful; for instance, when the genital parts exhibit great rigidity, heat, and dryness, the emollient injections, or frictions with mild ointments, such as cerate, or cucumber ointment, emollient fumigations, or bathing in lukewarm water, may be very advantageous. This last remedy, especially, is of marked utility where the abdomen is tender and painful, and the cervix uteri is rigid and resistant.

Within a few years, Professor Simpson has introduced into obstetric practice the use of those anæsthetic agents, which are daily productive of such wonderful results in surgery. The Edinburgh accoucheur does not, however, reserve ether or chloroform for difficult cases, but advises their use in the most natural labors. The importance of the subject demands of us a detailed examination; and a long article will be found appended, in which, after having stated the known results, we shall give frankly our own opinions.

Regimen of Women in Labor.—Those women whose labors are unusually short, need not, as a general rule, take any nourishment whatever; but when the travail drags along, it is necessary to sustain their strength by articles of easy digestion; thus, as many are in the habit of taking coffee with milk every morning, this may be allowed them without danger; and then, during the day, a few cupfuls of some broth may be given, though always in small quantities at a time. Where the stomach is disordered and vomiting takes place, as very frequently happens, even these liquid aliments will have to be restricted. This plan, however, is not applicable in all cases, since some must be allowed what we should refuse to others; for example, there is no necessity for subjecting robust country-women to the same severity of regimen as the delicate ladies of large cities. The choice of drinks is also a matter of some importance, and we may recommend some pure or sugared water, or a weak infusion of lime, or orange-leaves, of mallows, violets, &c. Lemonade, or wine diluted with water, will be very agreeable to most women at first; but, in general, they soon produce a sour stomach and eructations; all hot cordials and fermented liquors should be positively prohibited. In the country districts, there is often much difficulty in overcoming the vulgar prejudices on this subject; but the physician must insist upon it, for he ought never to lose sight of the distress and agitation that follow the administration of spirituous beverages, and which expose the patient to inflammations and active hemorrhages. Should it happen that her feeble condition requires any restoratives, then some good broth, or a little old wine, or a few spoonfuls of sherry-wine, are the only and the best means that can be employed.

ARTICLE II.

OF THE ATTENTIONS TO THE CHILD DURING LABOR.

Having determined the presentation and position, the accoucheur should next ascertain whether the child is living or dead, as it is highly important to determine this point, in order to diminish his own responsibility, by advising the family of the fact.

Before the membranes are ruptured, the diagnosis may be easily made out by ascertaining through auscultation the existence or absence of the pulsations of the fœtal heart, as also the continuance or complete cessation of the active movements, in regard to which the woman can always give sufficiently accurate information. After the rupture of the membranes, the active movements are feeble, and sometimes entirely absent; in which case, however, the pulsations are still detected by auscultation.

The touch also reveals certain signs which may shed still further light upon the question. Thus, when the child is alive and the head presenting, it often becomes affected with a sanguineous swelling, the size of which depends upon the length of time which has elapsed since the discharge of the waters. This tumor does not form when the child has ceased to live; and if its death dates back for several days, the resisting tumor formed by the sero-sanguineous infiltration will be replaced by a soft, flaccid, and wrinkled condition of the hairy scalp. Besides this, the bones of the cranium will be more movable, and the overriding of their edges greater than usual; a sort of crepitation is also produced by their rubbing against each other. A more embarrassing case is that in which the child dies some time after the rupture of the membranes, but not before the sanguineous tumor has had time to be developed. Even here the uncertainty will be of short duration, for, provided the labor should continue beyond three or four hours, the tumor will lose its consistency, and its softness and flaccidity render a mistake a matter of difficulty.

Finally, when the pelvis is rather contracted, the wrinkling of the scalp may simulate a swelling, whose diagnostic importance it is well to appreciate. In this case, says Merriman, the best means of judging of the life or death of the child by the tumor of the scalp is as follows: when living, it is observed that, at the moment when the head is strongly urged down by the contraction of the womb, the bones overlap each other, and, as a consequence, the scalp becomes folded, and thus constitutes a temporary tumor; but immediately after the pain is over, the head regains its primitive form, by the expansion of the cranial bones, and the folds and tumefaction previously exhibited by the skin disappear, or, at least, considerably diminish. On the contrary, however, if it be dead, the expansibility of the bones is destroyed, and the head does not reassume its primitive form and volume after the contraction has passed off; wherefore the tumor formed by the doubling of the hairy scalp still persists, in a great measure. Now, in this condition of affairs, the swelling is sometimes greatly augmented by the liquids forced in by the pressure from above, and whenever, in such cases, a perforation of the cranium has to be resorted to, practitioners well know there is half an inch at least of soft parts to be traversed before reaching the bone. (Merriman's Synopsis.)

If the face should present, the softness of the lips, and the flaccidity and immobility of the tongue, should lead us to suspect that the child is dead; since, when living, the firmness of all its parts, and the motion of the tongue, are often felt with ease.

In breech presentations, the introduction of the finger into the anus will detect a resistance and contractile power on the part of the sphincter if the child be living, which will be absent if the child be dead.

Lastly, in shoulder and arm presentations, the swelling of the member, and its violet hue, will afford an indication in favor of its life.

Should the cord hang in the vagina, its softness, withered condition, and the absence of pulsation in the umbilical arteries, would justify a belief that the child was dead.

A thick and fetid condition of the amniotic fluid, and a discharge of meconium, have been regarded as indicating the death of the child. The altered condition of the waters is of no great importance, since it has sometimes been found to coincide with perfect integrity of the fœtal life, but the discharge of meconium is of greater significance.

It is not at all uncommon to find the meconium escaping in greater or less quantity during parturition; and, as previously stated, this peculiarity most frequently occurs in the positions of the pelvic extremity, and is then of little consequence; but this does not hold good in any other presentation; for then its discharge is always an unfavorable sign, one calculated to arouse the anxious solicitude of the medical attendant, as it usually indicates a state of suffering on the part of the child, which is almost always due to a compression of the cord. It must be apparent, on the least reflection upon the part performed by the placenta during the intra-uterine life, that an interruption of the fœto-placental circulation produces asphyxia, which latter determines a cerebral congestion, and sometimes even an apoplectic effusion, whence a paralysis of the sphincter ani results. Now, if to this palsy of the sphincters, we add the instinctive acts of respiration[1] made by the fœtus, which are the more violent as they are the more ineffectual, we can understand without difficulty how an escape of the meconium may result from a compression of the cord.

As regards the prognosis, it is important to observe the precise moment at which this discharge takes place, as it is always serious when it does not occur till some time after the rupture of the membranes; though the waters, when they escape, are often colored yellow, and the presence of the meconium then is not necessarily an alarming symptom. In some cases, it may indeed indicate an actual compression of the cord; but it may also result from a compression that had existed some time before birth, which may have compromised the child's life for a few moments, and then have suddenly disappeared in consequence of some brisk movement of the infant.

It is not difficult to conceive that the cord might undergo a momentary compression during the last months of gestation, as also that it might be displaced by a sudden motion of the child, and the fœto-placental circulation be re-established in consequence. Now, this compression may have o long as to threaten asphyxia, and consequently to produce a dis- of meconium.

---

[1] Mayer has observed respiratory movements in embryos, even within the ovum, as soon as he compressed the cord.

avors have been made to determine by the physical characters of onium, whether its discharge was occasioned by a presentation of ch, or by the sufferings of the fœtus. It has been said that, in the ase, the meconium is very fetid, thinner, and more diluted, than e breech is above the uterine orifice. Such signs, however, are very isive.

e whole, therefore, a discharge of meconium in breech presentations tle consequence; but, in the other presentations, and where occur- ie time after the rupture of the membranes, it is always an unfavor- n; though, to judge of its value at the time of the rupture itself, must be had to auscultation.

l these signs, the best undoubtedly is that supplied by auscultation eart, whose pulsations are always perceptible if the child be living. te possible for the pulsations of the cord to escape detection even the fœtus be living, inasmuch as they sometimes stop during the d begin again when it is over. Therefore, certainty of diagnosis equire that the pulsations should have ceased for a considerable or fifteen minutes at the least.

tex presentations, as soon as the head is expelled its disengagement d.

diately after its expulsion, the disengagement of the head is com- ither by carrying it more and more towards the pubis, or by insinu- index upon one side of the lower jaw; this being accomplished, next ascertain whether the cord does not make one or more turns he neck, and if so, gentle tractions must be made on its placental y, to avoid its being dragged upon, and to prevent strangulation tus, &c.; and when a sufficient extent of it cannot be brought out, r the prevention of such accidents certain, we have to cut it, and e the labor as promptly as possible, by hooking one or the other with the forefinger.[1] After the head is born, the womb, exhausted st efforts, remains passive for some instants, and it frequently hap- t the child begins to respire and cry, even before the delivery of . We may, therefore, wait patiently until the contraction is re- imply supporting the head, lest the mouth and nose be choked up oths or blood found between the woman's thighs; but if the atony ged, and more especially if the face of the new-born infant is ob- be red and tumefied, as sometimes happens after painful labors, inder of the travail ought not to be left entirely to nature, but s should be at once solicited by frictions over the abdominal walls, patient be encouraged to bear down. The disengagement can al- ays be accomplished by moderate tractions upon the head grasped

---

folds may occasionally be drawn so tightly as to strangle and kill the infant, d in the following case: "Upon approaching a woman who had just been I found the child dead, and still lying near the genital parts; the cord made s around its neck, and they were so firmly tightened that a deep ecchymosis n this part." (Guillemot.)

by both hands; and if these measures prove insufficient, the index finger, curved like a hook, is to be placed in one of the armpits, and the disengagement of the anterior shoulder thereby first effected.

After the shoulders are disengaged, the spontaneous expulsion of the breech and lower extremities may also be delayed in consequence of inactivity of the womb. Here again, it is especially proper to endeavor to excite the contractions by frictions upon the abdomen; but should the life of the fœtus appear to be in danger, the extraction should be effected immediately.

The artificial extraction of the shoulders or of the lower part of the trunk, we see, ought not to be resorted to until expectation might become dangerous to the fœtus. When the expulsion is left entirely to nature, the womb contracts in proportion as it is emptied, and there is less cause to fear the consecutive inertia which is sometimes produced by too rapid an extraction.

In those rare cases, where the occiput remains posteriorly until the end of labor, most accoucheurs have recommended that an attempt should be made to bring it round to the front, but we doubt whether this will often prove successful, although we have never seen it tried, nor ever attempted it ourselves; for we believe that where the process of rotation does not take place spontaneously, all efforts to produce it artificially would be useless, not to say injurious. Nevertheless, most authors advise, when the head has descended into the excavation, immediately after the discharge of the waters, to make it deviate either towards the right or the left in the *interval between the contractions* (Velpeau), by slipping two or three fingers either along the sacrum, to press the occiput forward, or else upon the side of the forehead, behind the pubis, to carry it backward. If we should ever entertain the thought of attempting this manœuvre, we would much prefer acting during the contraction, for then we should only aid, without absolutely supplanting nature; we would prefer, whilst acting upon the occiput, as indicated by Velpeau, applying, at the same time, two fingers on the temples, and acting thereupon in such a way as to turn the forehead posteriorly. But, we repeat, this appears unnecessary in the great majority of cases, because it only hastens the process of rotation, which would have subsequently taken place without it; and even hurtful in others, for the efforts used to bring it about might exert a pernicious influence both on the mother and her child.

In fact, in ordinary cases, where the rotation is produced by the natural powers, the trunk follows the movements of the head; but where the latter has been turned by the fingers, the body remains immovable, and hence the process of forced rotation may dislocate the atloido-axoid articulation and kill the child.

The older accoucheurs thought that a spontaneous delivery, in face presentations, was altogether impossible, and consequently they advised an endeavor to be made, in the very outset of labor, to convert them into vertex positions; but we of the present day understand better the value of such opinions. However, the rotation by which the chin is brought under the symphysis pubis, whatever might have been its primitive relation to the superior strait (see *Mechanism of Delivery by the Face*), is difficult, painful, and sometimes, in the mento-posterior positions, does not take place at all. It will be seen, further on, that the non-accomplishment of this movement forms one of the most serious complications met with in practice, and that craniotomy often becomes necessary in consequence. When the face is engaged at the inferior strait, and the chin is found under the pubic arch, the movement of flexion begins, and then, as has been shown, the pressure to which the vessels of the neck are subjected, during the fourth stage, may retard the circulation enough to determine death by cerebral congestion. Hence, we learn what great precaution is necessary in supporting the perineum, since it must be evident that too great a pressure made upon this part would necessarily augment the compression of the child's neck.

The delivery by the pelvic extremity ought to be abandoned entirely to nature, unless there are some unfortunate complications. We have already insisted upon this point in the note at page 354; but do not hesitate to repeat again the advice, not to resort to any traction in a natural labor by the breech, because, as there stated, a stretching out of the arms, and sometimes even an extension of the head, result from such imprudent tractions, whilst these complications are scarcely ever met with where the expulsion is left to the uterine contractions entirely. Now, there is no difficulty in comprehending these different results, for when the womb is the sole agent of the delivery of the child, the latter is forcibly urged on by the circular fibres at the superior part of the organ, and at the same time is strongly pressed on its sides by the longitudinal fibres. The upper extremities are therefore maintained against the lateral and anterior parts of the chest, the head is kept flexed on the thorax, and all these parts descend together; but, on the contrary, if any tractions are made, they only act on the trunk, which then descends alone, while the arms, being arrested by the margins of the cervix uteri, or by the periphery of the straits, do not participate in the descent, and are ultimately found placed against the sides of the head; hence, the accoucheur's exclusive duty consists in receiving and supporting the lower parts of the child as they become disengaged; taking care, as soon as the breech has cleared the vulva, to ascertain the condition of the cord. For that purpose, the forefinger is slipped up as far as the navel, when, if the cord is found to be tightened at its umbilical insertion, he joins the thumb to the index so as to produce some traction on its placental extremity only, with the view of preventing both its being dragged upon, and its possible laceration. The cord sometimes gets between the infant's thighs; and, in such cases also, the loop thereby formed must be enlarged by pulling on the placental extremity, and then by disengaging it from the posterior limb, bring it into contact with the perineum, that is, with soft parts whose compression will be less severe, and consequently less dangerous to the circulation than what it would suffer from the symphysis pubis; but if it is too short to be brought to the exterior, it must be cut, and have a ligature applied on its umbilical extremity, and the labor be terminated as rapidly as possible.

But, whatever may have been the cause, the death of the fœtus always results from the slowness with which the shoulders and head are expelled, for it is only during this last part of the travail that the cord is compressed, or that a separation of the placenta takes place; hence, although we have condemned all traction in general, it must be otherwise under such circumstances. But how is it possible to determine the period beyond which it would be imprudent to wait? We answer, that as soon as asphyxia comes on, the suffering condition of the child may easily be detected by examining the portion of the cord which has been delivered; and if the pulsations still maintain their intensity, their frequency and habitual regularity, the rest of the process may be abandoned without danger to the powers of nature; but, on the contrary, if they are found to relax, or even to become more rapid, though at the same time more feeble, thread-like, and especially if intermittent or irregular, every effort must be used to remove the fœtus from the danger which threatens it.

The signs furnished by the irregularity of the pulsations of the umbilical arteries, and to which great importance has been attributed by some authors, only become sensible after the asphyxia has lasted for so long a time that it is not always possible to overcome it; therefore we regard as much more available the phenomena next to be mentioned.

When the head alone remains behind in the pelvic excavation, the child is very often observed to dilate its chest actively, and make a violent inspiratory effort, which may be referred to a rapid convulsive contraction of the diaphragm and abdominal muscles, repeated at irregular intervals; now such acts never take place while the fœto-placental circulation remains intact, since the pulmonary respiration is unnecessary so long as the placental one is going on, and therefore these struggles constantly announce a state of suffering, or of imminent asphyxia, from which the infant must speedily be relieved. Where the head alone is undelivered, the patient must be encouraged to bear down strongly, so as to hasten the termination of her labor, and avoid a prolonged compression of the cord; and the accoucheur might facilitate the flexion of the head by gently carrying the trunk up in front of the symphysis, or when the flexion appears difficult, he may, by insinuating two fingers under the symphysis, press slightly on the occiput; for a comparatively light force exercised on the posterior part of the head is often sufficient to reverse the great occipito-mental diameter, and terminate the delivery. Should the head resist these efforts, other measures become necessary; but they belong to instrumental delivery, and we shall treat of them in the article on *Version*.

Finally, should it be impossible to extract the head immediately, we may endeavor to introduce the fore and middle fingers into the mouth of the child, and then separate them slightly, so as to leave an open space through which air might find its way to the mouth. The same object would be effected with still greater certainty, by introducing a large catheter into the mouth.

This book is the property of
COOPER MEDICAL COLLEGE,
SAN FRANCISCO, CAL.
and is not to be removed from the
Library Room by any person or
under any pretext whatever.

CHAPTER VIII.

OF THE ATTENTIONS TO THE WOMAN AND CHILD IMMEDIATELY AFTER DELIVERY.

ARTICLE I.

OF THE ATTENTIONS TO THE WOMAN IMMEDIATELY AFTER DELIVERY.

As soon as the child has been expelled, the accoucheur should place his hand upon the mother's abdomen in order to ascertain whether there is another child, as also to learn whether the uterus contracts well, inasmuch as inertia of the organ should lead to the anticipation of hemorrhage. It would also be right to determine whether there be too free a discharge of blood from the external parts.

The expulsion of the placenta and its annexes, whether spontaneous or assisted by the accoucheur, generally follows very shortly after the exit of the fœtus. In order to avoid separating the study of this natural delivery of the after-birth from that of the difficulties and dangers which may attend it, we shall treat of them separately. (See *Delivery of the After-birth.*)

After the delivery, the accoucheur should ascertain, both by the external examination and the vaginal touch, whether the placenta has drawn down or inverted the fundus of the womb, for the purpose of rectifying it at once if such an accident has occurred. If everything proves to be in its natural condition, frictions with the hand are to be made over the hypogastric region from time to time, in order to excite the retraction of the uterus, and thus favor its disengorgement, and the expulsion of the coagula which may be still contained there. The patient is allowed to remain for some minutes on the bed where she was delivered, so as to give her a little repose, as well as time to the uterus and vagina to clear themselves of the blood, which flows at first in abundance, and would soil the linen in which she is about to be enveloped. Besides, a few minutes are ordinarily devoted to paying those necessary attentions to the infant, hereafter pointed out. In fact, she might remain upon the same bed a still longer period, when the delivery has either been preceded or followed by syncope, hemorrhage, or any other accident, or even where there is reason to fear something of this nature, taking care, however, to substitute dry things for those that have been soiled. She ought to lie perfectly flat, the thighs stretched out alongside of each other, lightly covered, and be left in silence, and the most absolute rest of both body and mind. In about half an hour, the patient will again require special attention; the genital organs, and upper part of the thighs, are to be first washed carefully and gently with lukewarm water, pure or mixed with a little wine; then they are to be wiped with warm and well-dried towels, and all the garments worn during parturition that have been soiled by the perspiration, discharges, and fecal matters, are removed, and replaced by others, previously well dried and warmed; their shape is unimportant, the only point requisite is to have them large enough not to incommode the woman in any way, and to admit of being changed easily and promptly. The greatest celerity is to be used in this toilet, lest she should be long exposed to the air; the arms and breast particularly ought to be well clothed, so that the patient may, during the day at least, keep them out of bed without danger of taking cold.

All these preparations being completed, she is next to be transferred to the bed intended for her reception during the lying-in. Many females, finding themselves well enough, want to walk across to the permanent bed; but against such an imprudence the physician must interpose the whole weight of his authority. The one to which she is to be transported must be previously warmed, and provided with a sufficient amount of covering that can easily be changed; though the coverlets should not be thicker or more numerous than those used before pregnancy.

There is a custom much in vogue of surrounding the belly with a moderately tightened bandage; and the women, for the most part, attach the highest importance to this measure as a preservative against the wrinkles and folds that are found after labor on the skin of the abdomen, as also to prevent the latter from remaining too voluminous. Their desires may be yielded to the more willingly, as such a bandage, when moderately drawn, supplies the pressure no longer afforded by the abdominal walls, and thereby prevents the afflux and stasis of the fluids, the engorgement of the uterine walls, and the dilatation of the cavity of this viscus; and it has the further advantage of obviating the tendency to syncope, and of diminishing the after-pains. But, in order to obtain all these benefits, it should be large enough to compress the whole sub-umbilical region equally. Care should be taken to prevent its becoming doubled up, whereby a circular cord is formed, which, from opposing the ready return of the fluids, would then prove a cause of hemorrhage.

The body bandage may be substituted with advantage by a folded cloth applied flat upon the abdomen which it compresses gently by its weight, which is sufficient for the purpose.

Some women, influenced by a feeling of coquetry, also desire to compress their mammæ by means of a bandage, with a view of preventing their enlargement, and their consequent softness and flaccidity, and some even go so far as to apply topical astringents for the purpose of obviating an over-abundant secretion of milk; but such measures should be proscribed in the most absolute manner, since they might prove very dangerous. These organs only require a sufficient amount of covering to protect them from the contact of the external air, and to maintain a proper degree of heat.

ARTICLE II.

OF THE ATTENTIONS TO THE CHILD IMMEDIATELY AFTER ITS BIRTH.

The management of the new-born infant necessarily varies according to whether it is strong, vigorous, and healthy; or whether, on the other hand, it is born in a state of debility or disease.

§ 1. Of the Child in a Healthy State.

When the child escapes from its mother's womb living, and in a healthy state, the circulation existing between it and the placenta is observed to continue for some time, where the delivery is abandoned entirely to the powers of nature; the after-birth is soon detached and expelled, and then it as well as the cord loses its vitality, the circulation becomes weaker and weaker, and the pulsations in the arteries gradually cease, commencing at their placental extremity; and some authors have advised this event to be waited for before cutting the cord; but as this spontaneous delivery most generally requires a long time, it is customary to make the section immediately after its birth, and then the following attentions to the new being become necessary, namely: where the infant is entirely clear of the mother's parts, the cord is disengaged if it had been twisted around its neck or body, and the child is placed on the side, having its face turned away from the vulva, so that it may breathe freely without running the risk of being suffocated by the liquids that escape from the vagina. The umbilical cord is next cut at about five or six fingers' breadth from the abdomen, generally using the scissors for this operation, though it may be done with any cutting instrument whatever. As soon as the section is effected, the cut extremity is slightly pinched between the thumb and forefinger, while the remaining three fingers grasp the breech, and the other hand is placed under the shoulders and neck of the child, which is thus lifted out of the bed, and placed on the nurse's knees prepared for its reception. It may then be examined more at leisure, to ascertain that no loop of intestine exists at the base of the cord, and to permit the latter to bleed if judged advisable, before applying the ligature. A ribbon, eight or ten inches long, may be used for this latter purpose, or a cord consisting of a skein of coarse thread; but, before applying it, the gut is to be reduced if there is an umbilical hernia, and then it ought to be tied at about two, three, or four inches from the surface of the abdomen; the only precaution requisite is to avoid placing it around the skin, which is prolonged more or less upon the cord; for pain, inflammation, and ulceration would thereby result, the subsequent cure of which might be attended with some difficulty. As a general rule, it is best to leave sufficient space between the ligature and the fold of the skin, to allow of the application of a second, should the first prove insufficient. The ligature must be drawn tight enough to obliterate the arteries completely and permanently, without cutting their coats. If the cord happens to be thick and infiltrated, the ligature will strangle its vessels but very imperfectly; and when it afterwards becomes diminished by the escape or evaporation of the fluid parts, the vessels being no longer compressed, will obviously permit a free discharge of blood from the cut end. Besides, the putrefying of the lymph will soon produce a very fetid smell, and irritate the skin wherever it comes in contact; and it is therefore, to prevent such accidents, that authors very properly recommend the expression of this viscid fluid by pressing and slipping the cord between the fingers, and even by pricking its enveloping membrane, taking care, however, to avoid wounding its vessels; and lastly, if the cord were unusually large, it might, for greater security, be bent backward after the first knot was tied, and be included in a second one. Where there is reason to suspect a twin pregnancy, it is necessary after cutting the cord of the first-born to apply a ligature around its placental extremity also. Though the application of the second ligature is, in most cases, a useless precaution, yet the fact that in some very exceptional cases in which a communication exists between the vascular ramifications of the two placentas, it might prevent a hemorrhage which would quickly prove fatal to the second child, is sufficient reason for never dispensing with it.

Numerous discussions have sprung up as to whether the ligature of the umbilical cord was absolutely indispensable, and, if so, whether it should be applied prior to the section, or whether the cord might be cut before it is tied. Now, although it is highly probable that the circulation in the umbilical vessels would be arrested spontaneously, after the regular establishment of the respiration; as, also, that the ligature is almost or entirely useless in the great majority of cases, yet, if it is certain that a hemorrhage has taken place in some few, even though they be exceptional instances, from the cord having been imperfectly tied, or else not ligated at all; this, of itself, is a sufficient reason for not neglecting so simple a precaution; and as to the second question, the course just pointed out is, in our opinion, decidedly preferable.

The surface of the child's body is next to be cleansed of the ceruminous substance that covers it, and from the blood and other matters which become attached at the moment of delivery; but as this can scarcely be removed by a simple rubbing with dry towels, it should first be diluted with a little oil, or fresh butter, and then be gently wiped off; the yolk of an egg would produce the same effect, and besides, would render this matter more miscible with water. To get rid of the blood and other impurities, water mingled with wine, or else a simple bath, into which the child is plunged, is most generally employed; the temperature of the bath should be about twenty-five degrees (77° Fahr.).

The infant being well washed, sponged, and wiped, is next to be dressed; but, before doing so, the physician himself should first envelop the cord in a compress intended for that purpose; which compress is merely a piece of fine linen, of a square shape, and having an opening at its centre large enough to allow the cord to pass through it easily, and then, after having ripped one of its sides from the free margin down to this hole, the root of the cord is lodged at the bottom of the resulting fissure; then the uncut part of this little compress remains below, and the two halves of the divided portion are turned over and crossed in front of the cord, the whole being placed at the upper and left side of the abdomen. A second soft and square compress covers the first, and a band three or four fingers' breadth wide, and long enough to go twice round the body, supports the whole of the little apparatus in this position.

Before enveloping the cord, the dressing of the child had already commenced, its head, arms, and chest being then covered. The rest of its clothing should be warm, soft, and moderately tight. In France, it consists of a camisole, or little woollen jacket, furnished with a soft chemisette that is fastened behind by pins, then one of linen, and another of wool or cotton. The English envelop their children in a long, loose robe, or something like a flannel sack.

Before dressing the child, the physician should ascertain whether it is affected with any malformation; and during the three or four days following its birth, he ought carefully to watch over the excretion of urine and of meconium (for the expulsion of the latter is sometimes delayed for that length of time), and to facilitate it by plunging it into a tepid bath, when he is certain the infant is well formed. The prolonged retention of the meconium is also an indication for the employment of some mild laxative, such as whey, the syrup of violets, the oil of sweet almonds, or manna; the compound syrup of succory is also very generally used, or the compound syrup of rhubarb, either alone or mixed with sweet almond-oil, in the quantity of two drachms or half an ounce in the course of the day. Some persons administer these gentle remedies to all children without distinction, more especially to those that are wet-nursed, for the purpose of supplying, they say, the place of the colostrum, or first maternal milk, whose slightly purgative action clears out the intestinal canal; but the warm water and sugar ordinarily given to the child as nourishment on the first day, is usually quite sufficient to facilitate the expulsion of the meconium, and the viscid fluids that sometimes obstruct the fauces and stomach.

All questions having reference to the hygiene and nursing of infants will be treated of in a special chapter.

§ 2. Of the Child in a Feeble or Diseased State.

The ordinary attentions to the child, when born in a healthy condition, have just been described; but it not unfrequently happens that the infant, at the moment of its birth, is in a state of great debility, or even of apparent death, which would soon be followed by a real one, if adequate measures were not resorted to at once to prevent it. This apparent death shows itself under two widely different aspects, which have been described by most authors as the apoplexy and the asphyxia of new-born children. Many English and German accoucheurs have for a long time rejected these denominations, as characterizing but imperfectly the pathological conditions to which they were applied; and M. P. Dubois, in a more recent article, after having remarked that the most constant anatomical character of apoplexy in the adult is wanting in what has been called the apoplexy of the child, and that wide differences also exist between the symptoms of asphyxia in grown persons, and those of the asphyxiated state of the new-born infant, likewise concludes that the same name has been improperly applied to such dissimilar conditions; and consequently he, like M. Nægèle, designates that state of the child in which no sign of life is observed, and none of those of death is recognized, under the title of apparent death.

Both terms of this definition are evidently contradictory, since death is characterized by an entire absence of the signs of life. For our own part, we regard apparent death as a state in which, notwithstanding the abolition of the actions of animal life, some at least of the functions of organic life continue, and, of necessity, the pulsations of the heart.

Now, in carefully examining the symptoms of the child's apparent death, it is found that it is sometimes characterized by a vivid redness of the face and upper part of the body, by a prominence and injection of the eyeball, and a swelling of the countenance, the skin of which is dotted here and there with bluish spots; while at others, we are struck with the discoloration in the skin, and the flabbiness of the flesh. In the former case, the head is swollen and very warm, the lips are tumefied and of a deep-blue color; the eyes start from the head, and the tongue adheres to the roof of the mouth; the head is often elongated, hard, and the features slightly swollen; the pulsations of the heart, though sometimes quite strong and distinct, are at others obscure and feeble; occasionally the umbilical cord is distended with blood.

In the second, the child exhibits a mortal pallor; its limbs are pendent and flabby; the skin is discolored, and is often soiled by the meconium; the lips are pale; the lower jaw hangs down, and the umbilical cord and heart either do not palpitate at all, or but very feebly. An infant, in this condition, often moves at the moment of birth and cries, but soon falls back again in a state of apparent death.

These diversities in the physical characters of children born in a state of apparent death, may be occasioned, doubtless, by various causes, though they are also often due, simply, to a greater or less advanced condition of the same pathological state; hence it is wrong to regard them as the characteristic signs of quite dissimilar lesions. Therefore, although I am convinced that they sometimes furnish indications for very different kinds of treatment, and that under this point of view it is important to observe them carefully, I cannot regard them as affording a basis for nosological distinctions which it is impossible to justify. As the expression *apparent death* presupposes nothing in regard to the nature and cause of that state, it deserves on that very account to be retained.

That what we are about to state respecting the apparent death of new-born children may be the better understood, we shall give, first, a brief exposition of the mechanism by which respiration is established immediately after birth.

All physiologists admit, that the medulla oblongata is the centre and regulator of the respiratory movements of the adult. From it also is sent forth the motor impulse which gives rise to the first act of inspiration.

Marshall Hall has endeavored to prove, experimentally, that the first inspiration is the result of a reflex action,[1] produced by the excitement of the nerves of the surface of the body, especially of the trifacial, by the contact of the external air, and that the respiration, when once established, is sustained through the influence of the reflex action due to the irritation of the pneumogastric nerves by the contact of the air introduced into the lungs.

[1] An impression made upon our organs may give rise to movements of different characters, by pursuing different routes to the cerebro-spinal axis. Thus, sometimes, when transmitted directly to the encephalon by the sensitive nerves of the cranium, or indirectly through the nerves of the spinal marrow, it is transformed into a sensation in that part of the encephalon in which the *sensorium commune* is situated, and consequently reaches the consciousness of the animal, who is then capable of reacting by voluntary movements. Sometimes, also, it is transmitted by the nerves of sensation either to the encephalon or to the spinal marrow, which impression, without necessarily being transformed into a sensation, may produce an excitement which is immediately reflected upon the motor nerves, and gives rise to the so-called *reflex* movements, in the production of which the will has no part whatever.

The power which thus gives rise to movements without the participation of the will, has been regarded as a special endowment of the cerebro-spinal axis, and has been designated as the *reflex power, faculty, or property*.

The same physiologist also holds that the respiratory movements may take place under the influence of other causes; such, for example, as the impression produced upon the medulla oblongata by a great loss of blood, as also the excitement which it undergoes from the contact of venous blood. Into the latter category enter all the respiratory movements of incomplete asphyxia.

In normal cases, the fœtus, having in no wise suffered during the labor, retains its cutaneous sensibility intact, and the irritation produced by the contact of the air with the cutaneous nerves is transmitted to the medulla oblongata, which, acting in its turn upon the respiratory nerves, produces the movements of respiration.

But should it happen that the fœtus from the moment of birth has been deprived for a certain time of those means of respiration which it finds in the placenta, or that, the latter being separated immediately after the child is expelled, any obstacle should arise to the introduction of air into the bronchia, there would be, in both cases, a commencement of asphyxia. The contact of the non-oxygenated blood would irritate the medulla oblongata, and this irritation being transmitted to the inspiratory nerves, may also give rise to respiratory movements of the muscles of the face, breast, and abdomen, and produce, in short, the first inspiration.[1] The central motor impulse would soon be substituted by the reflex action of the ramifications of the pneumogastric nerves, which are irritated by the air introduced into the lungs, and the respiration would continue under its influence.

When the fœtus is threatened with asphyxia in the latter stages of pregnancy or during labor, in consequence of compression of the cord or separation of the placenta, its death is preceded by convulsive movements and efforts to breathe; then the mothers tell us, that the child, after having moved actively, suddenly became quiet; and Beclard saw a fœtus inclosed in the unruptured membranes make inspiratory movements, and breathe water instead of air. It is for this reason, also, that in certain positions of the face the child has been enabled to respire, although still inclosed in its mother's womb; and the uterine vagitus, which always supposes a previous inspiration, can be explained in no other manner. In all these cases, in fact, the non-oxygenated blood acts as an irritant to the medulla oblongata, which transmits the irritation in its turn to the nerves of inspiration. Nothing can be claimed here for reflex action.

We must be careful, however, not to confound these two excitors of the inspiratory act. The first is the natural excitant, whilst the other is always pathological, and only intended to replace the normal stimulus. Now, every pathological act is but an effort to accomplish some physiological process, which has become difficult or impossible; and though it may in some cases restore life to a child, it is likely, in many others, to prove insufficient.

---

[1] Marshall Hall removed the brain of a kitten, cut the pneumogastric nerves, and opened the trachea. He found the respiration to become slower, though it continued with regularity. When he stopped the opening in the trachea, the scene changed immediately; the animal opened its mouth widely, made violent inspiratory efforts, and was affected with some movements of a convulsive character. When the trachea was reopened, the respiration became as regular as before, and when closed again, the symptoms of asphyxia reappeared; in both these cases, the central organ, or the medulla oblongata, was evidently the source of the respiratory impulse; since the destruction of the brain and the section of the pneumogastric nerves rendered all reflex action impossible.

It very often happens that a child born in a semi-asphyxiated condition, in consequence of a difficult labor, makes a few sudden and violent inspiratory movements, but would nevertheless succumb rapidly, were not the reflex action called into play, and did it not soon replace completely the pathological excitant, which, just before, had acted alone upon the spinal marrow. As the skin, in this state of diminished sensibility, is no longer stimulated sufficiently by the external air, special means should be resorted to whilst there is yet time to arouse the excito-motor action of the cutaneous nerves, and provided the asphyxia has not gone too far, they will often be crowned with success. But if the child is small and feeble, or if the causes of the asphyxia have acted for too long a time, the contractions of the inspiratory muscles are feeble and distant, and soon cease entirely; the heart, too, ceases to beat, and the child dies. Though, whilst the heart is still beating, we may succeed in exciting the reflex action of the muscles of inspiration, to the extent of producing a sudden inspiratory movement after every excitation, the symptoms of asphyxia remaining, however, unchanged, the child will die in spite of all that can be done.

If it be true that the impression produced by the external cold upon the skin of the body and face, is the first and only cause of the reflex action of the medulla oblongata upon the nerves of inspiration, and thus produces the first inspiratory act, we can readily understand that everything calculated to diminish notably or to destroy the cutaneous sensibility, will retard, or even render impossible, the first inspiratory effort, and reduce the fœtus to a state of apparent death. The causes of the latter are, therefore, such as paralyze to a greater or less extent the nervous centres, whose influence, though completely foreign to the maintenance of fœtal life, becomes indispensable to the establishment and continuance of extra-uterine existence.

Now, these causes are quite numerous; and, with the exception of a few, exert their destructive influence during the latter periods of labor. They may be divided into: 1, lesions of respiration; 2, lesions of circulation; 3, lesions of the nervous centres. The first are capable of producing various degrees of asphyxia; the second may give rise to a fatal hemorrhage as regards the child; the third affect the nervous centres directly, and render them incapable of performing the functions to which they are destined immediately after birth.

1. *Lesions of the Respiration.*— These are occasioned by everything which obstructs the respiration. Thus, there have been pointed out as occurring during labor, the compression of the umbilical cord between the sides of the pelvis and the head or body of the child; the winding of the cord so tightly around the neck or some other part, as to obstruct simultaneously the venous circulation in the brain, and that of the blood in the umbilical vessels; the premature separation of the placenta, whether it be inserted upon the neck or not, for since the separation necessarily produces the rupture of the utero-placental vessels, it renders the fœtal hæmatosis as impossible as does the compression of the cord; the great retraction of the uterus, when in delivery

by the breech the head only remains in the excavation, and the child is unable to respire; for this retraction renders the vessels of the uterus almost impermeable to blood. In all these cases, the asphyxia results evidently from a suspension of the placental respiration, and it is the contact of black blood with the brain, which paralyzes its action in the fœtus as well as in the adult.

Finally, it is plain that after the child is born, the accumulation of mucus in the nose, mouth, and air-passages, may also produce asphyxia by preventing the introduction of air into the bronchiæ; here, however, the mode of operation is precisely the same as in the adult, since it results from a mechanical obstacle to the introduction of the external air into the pulmonary vesicles.

In consequence of the action of some one of these causes, the fœtus may be born in a state of apparent death, and exhibit the very different symptoms which we have already mentioned; thus, in most cases, the surface of the body has a swollen appearance, and is of a violet, or rather of a blackish-blue color, the discoloration being more marked at the upper parts of the trunk, and more particularly on the face than elsewhere. The muscles are motionless; the limbs preserve their flexibility, and the body its heat; the pulsations of the cord, of the radial artery, and even those of the heart, are obscure or insensible.

Where a *post-mortem* examination is made, the vessels of the encephalon are found engorged with blood; at times, this fluid is even effused on the surface of the membranes, or into the substance of the brain itself, though most generally, says M. Cruveilhier, the effusion is limited to the surface of the cerebellum; sometimes it covers the posterior lobes of the cerebrum, but it is rarely found in the ventricles of the brain; and, in all the cases examined by him, there was blood enough in the cavity of the vertebral arachnoid membrane to distend the dura mater. Again, those congestions of the liver that are so common in infants, are then particularly apt to be met with; but, says Billard, they vary considerably as regards the quantity of blood accumulated in the tissues of the organ; for, in some instances, it is found there in such great abundance as to give rise to a sanguineous exudation on the exterior of the organ, the convex surface of which is discolored and moistened by a layer of effused blood, and I have even known an extravasation of this fluid into the abdomen to result from this turgescence. The lungs are also gorged with blood.

The external condition of the asphyxiated fœtus is not always such as we have just described, for, as M. Jacquemier has observed, nothing is more common than to find the fœtus born without any anomalous coloration of the skin, and even with a remarkable degree of pallor and flaccidity of the limbs; and this, notwithstanding the apparent death has been produced by compression of the cord. Can this difference be due, as M. Jacquemier supposes in the latter case, to a sudden suspension of the placental respiration, whilst in the former the cessation was slow and gradual? This explanation is probable, inasmuch as the same differences are observed in the asphyxia of adults, and as, according to M. Devergie, those persons who are killed by the falling in upon them of earth, present the same discoloration of the integuments. The suddenness of the real death may explain the peculiarity under these circumstances; but it must not be forgotten that this external pallor is also the consequence of a slow but prolonged asphyxia, and that it often succeeds to the violet hue of the tissues; that we every day witness this succession going on before our eyes when the asphyxia has lasted too long, and that a child born with a very deep color, becomes rapidly pale and flaccid, if the means employed fail to excite respiration.

In the latter case, the discoloration of the tissues is the symptomatic expression of a more advanced stage: the pulsations of the heart, which before were sufficiently strong and rapid, become less frequent and feebler, return only at long intervals, and real death soon succeeds to the apparent one. Now these phenomena, which we observe occasionally, take place in the same manner whilst the fœtus is still contained in the womb, but is deprived of the placental respiration.

When, at the moment of birth, the asphyxia has lasted but a short time, the child will exhibit turgescence of the face, the violet hue of the skin, firmness of flesh, and frequent and regular pulsations of the heart; if a longer period has elapsed since the interruption of the fœto-maternal circulation, the child will be pale and discolored, and the pulsations of the heart and cord feeble and intermitting; finally, if the asphyxia has lasted longer than is compatible with the life of the heart, the child will be really dead at the time of its expulsion.

These two conditions, which are apparently so different, are due to the same cause, and are simply two degrees of asphyxia. Though in an etiological sense, no distinction can be made between them, they are important as regards the prognosis, for one is much more serious than the other, and, as regards treatment, the same means are not applicable to both.

M. Pajot informs me that he has found these observations to hold true as regards the adult.

2. *Lesions of the Fœtal Circulation.*—Ruptures of the cord or of the placenta may, of themselves, give rise to such a degree of hemorrhage as to endanger the life of the fœtus; fortunately, however, they are quite rare. When the hemorrhage is profuse, the child dies before the labor is over; but should anything happen to arrest the discharge of blood, the child may be born alive, but in a state of apparent death resembling syncope. The deficiency of nervous influence is here manifestly due to the fact that the medulla oblongata and the brain no longer receive a sufficient amount of blood to enable them to react upon the nerves of inspiration. The condition is a most dangerous one. The child is pallid, and its muscles are completely relaxed; sometimes, however, it makes a few short inspirations, and utters some very feeble cries; but if the hemorrhage has been at all profuse, it succumbs in a very short time.

3. *Lesions of the Nervous Centres.*—The cerebro-spinal system presides over none of those functions whose integrity is necessary to the maintenance of fœtal life; the respiration, circulation, and nutrition being subject exclusively to the nerves of organic life. These ganglions and their nerves derive from the arterial blood that principle of organic sensibility and motility which is necessary to the production of involuntary or automatic

movements, as also to the maintenance of the irritability and vitality of the organs. Although the fœtus possesses organs of animal life, its vitality is purely vegetative or organic. This fact serves to explain the life and development of acephalæ, for where the organs are absent, the functions are also wanting; yet these monsters are endowed with irritability, are capable of motion, and their life is preserved intact, until the termination of pregnancy.

Since the brain and spinal marrow have nothing to do with the performance of the fœtal functions, we readily foresee that any lesions which may affect them during pregnancy or labor, cannot disturb the harmony of those functions, or have any influence whatever upon the intra-uterine vitality. Therefore it is only after birth that the cerebro-spinal alteration or paralysis prevents the establishment of animal life, even though the organic life is still manifested by the integrity of the circulation, and even of the placental respiration. The first respiratory act is, as we have said before, the consequence of an excitement of the medulla oblongata, produced by the impression of the temperature of the surrounding air upon the skin of the new-born child. For this impression to be effectual, however, it is necessary that the sensation should be perceived by the central organ, which is rendered incapable of perceiving it by serious lesions of the cerebro-spinal axis. This important distinction should therefore be made between the various circumstances capable of reducing the fœtus to the state of apparent death, namely, that the fœtus may be destroyed in the womb by asphyxia and hemorrhage, whilst lesions of the nervous centres always cause it to be born in a state of apparent death.

We should also interpret in this way the effect which may be produced by the violent compression which the brain undergoes in certain cases of contracted pelvis; that which may result from the application of the forceps or lever under circumstances of difficulty; that which results from vascular congestion due to an obstruction to the return of venous blood in certain deliveries by the face; in cases where the cord is wound tightly several times round the neck, as also where it is strongly grasped by a spasmodic contraction of the neck of the uterus; and finally, to the compression sometimes produced by effusions of blood, either upon the surface, or into the substance of the brain itself.

So, also, is to be explained the mode of action of lesions of the medulla oblongata, such lesions as we know are easily produced by extreme rotation of the head, by tractions upon the head, or the pelvis when the head is arrested in an elevated position, and finally, by effusions at the base of the brain and upper part of the vertebral canal.

As lesions of the brain are not absolutely incompatible with the establishment of respiration, they are not so dangerous as those of the medulla oblongata. The destruction of a large portion of the encephalon has not always prevented the child from breathing and crying after its birth, and even from living for several days. A similar fact is presented by anencephalous fœtuses. By this we are advised that, in difficult labors, the temporary compression of the head may also suspend momentarily the action of the brain, but that as this suspension does not absolutely preclude respiration, the species of shock or concussion which the brain experiences may pass away so soon as not to interfere with the continuance of life.

It is different, however, with lesions of the medulla oblongata, which is the only motor of the respiratory movements: it cannot be seriously affected without rendering extra-uterine life impossible. This explains the frequent death of children in pelvic presentations, when tractions have been made upon the trunk with the object of disengaging the head.

Treatment.—Since apparent death, however produced, may present the very different symptoms already mentioned, it is evident that mere inspection of the child can afford no information as to the cause of its condition. Although we regard the discoloration of the skin and relaxation of the extremities as signs of very grave import, it is impossible to determine the extent of the cerebral disorders, and consequently to foresee the result of measures calculated to restore the child. In this state of uncertainty, all cases should be treated as though they afforded a chance of success. The lapse of half an hour, an hour, or even more, from the time of delivery, is not sufficient cause for despair, since a number of facts may be mentioned going to prove that children have been in an asphyxiated condition for an hour, and were afterwards restored to life. Long continued silence of the heart, the entire absence of pulsations at the præcordial region, frequently determined at intervals, is the only sign which can be regarded as destructive of all hope. The heart is the *ultimum moriens*, and I do not believe that efforts to restore its pulsations, when once completely extinguished, have ever been crowned with success. But the softness and flaccidity of the tissues, and coldness of the body and face,[1] are no reason for abandoning the child, provided the heart still beats, however feebly, slowly, or irregularly.

When the child is born with a general injection of the capillaries of the face and trunk, when, in short, it presents the characters of the state formerly termed *apoplexy*, it is evident that the first indication is to relieve the engorgement of the head and lungs, which is done by promptly cutting the umbilical cord, and allowing a few spoonfuls of blood to escape, when the respiration is most usually established soon after, if there are no mechanical obstacles, such as mucus in the fauces, to the introduction of air into the lungs; and where these do exist, they may be removed by the extremity of the little finger, or with the feathered end of a quill; the blue and violet color of the surface will then be found to gradually disappear, and give place to a rosy hue, at first on the lips, then on the cheeks, and afterwards over the rest of the body. However, in practice, we sometimes find the circulation so enfeebled or benumbed, as it were, that the blood will not run from the umbilical arteries; its effusion may then be encouraged by plunging the child into a warm bath, or by squeezing the cord several times from its insertion towards the cut extremity; and where this does not prove successful in obtaining blood, some advise the application of a leech behind each ear. But as this application would occasion the loss of precious time, it is better to have recourse at once to other measures.

---

[1] The experiments of M. Brown-Séquard on warm-blooded animals, prove that the time for which they are capable of resisting asphyxia is greater in proportion as they are subjected to a lower temperature.

The small bleeding being practised or not, every effort should be made, by the use of various stimulants, to excite the sensibility of the skin, and the reflex action of the cutaneous nerves.

According to Marshall Hall, the best plan is to sprinkle the face and body of the child vigorously with cold water; immediately after which, it should be immersed in a warm bath, and then wrapped in warm flannels. The efficiency of this plan of treatment, which may be repeated several times, depends especially upon the rapidity with which it is executed. The impression of both the cold and heat should be sudden. Afterwards, the skin may be stimulated by frictions with the hand, or a brush, by dry flannel, or with any irritating liquors, such as vinegar or brandy; M. Moreau strongly recommends, and with reason, slight blows to be made with the palmar surface of the fingers upon the shoulders and thighs. In grave cases, I prefer flagellating the thorax and loins vigorously with a piece of wet linen. It is also often very useful to irritate the mucous surfaces. A little brandy or vinegar may be placed in the mouth, or the fumes of burnt paper blown into the anus. A feather may be dipped into vinegar and then introduced into the nose or fauces; this may be used at the same time to clear away the mucous secretions of the latter, which prevent the inhalation of air; and where there is reason to suppose that such secretions have accumulated to a considerable extent in the air-passages, the advice of Dewees should be followed, by placing the child on its belly, taking care to elevate the feet higher than the head, and at the same time gently shaking it, so as to clear out the trachea, and thus facilitate the introduction of air; "for," says the American author, "this is a measure of great utility, by which I am every way persuaded that I have preserved the lives of many children." After a few moments, the child should be again plunged into a warm bath, rubbed with warm flannels, and then immediately subjected to cold aspersions.

All these measures should be continued for a long time after respiration has been restored and become regular, in order to prevent secondary asphyxia.

The child's body may be exposed with advantage to a current of cold air, giving it at the same time a swinging motion, and even after it has been restored and dressed, its face may be exposed to the fresh air, or, what is better, fanned, for a short time.

It has been advised to make use of strong suction on the breasts, for the purpose of dilating the thorax mechanically, "which," says Desormeaux, "although without effect for the proposed object, appears to me admirably calculated to stimulate the muscles that move the ribs." But a more powerful remedy, highly extolled by the same author, is a sort of douche made by the mouth directly on the parietes of the thorax; this douche is performed by taking a mouthful of brandy and blowing it forcibly against the breast; and it is rarely necessary, he remarks, to repeat it many times, for it is found to produce a convulsive contraction of the inspiratory muscles almost immediately; the blood and air penetrate the lungs, and the respiration is irregularly established, being at first feeble and spasmodic, but soon becoming stronger and more regular. I have often used successfully with the same object, a cold douche, produced by pouring a stream of cold water upon the præcordial region, from an elevation of about a yard.

If the excitation of the spinal and facial nerves is insufficient, the branches of the pneumogastric nerve should be acted on by insufflation.

This measure can now boast of such a degree of success, as to make it proper to have recourse to it whenever the means just mentioned have failed. M. Depaul has, in an excellent memoir upon the subject, completely refuted the objections urged against it, and confirmed by his experiments the previous results of Duméril and Magendie. Like them, he found that a false idea has been entertained of the powers of resistance of the pulmonary vesicles, and that it is necessary to blow much more strongly than is required to produce a simple dilatation, in order to effect their rupture. He has proved by instances, that children have been restored to life, whom the failure of the means commonly advised seemed to devote to certain death; also, that in cases where it was unsuccessful, because the lesions occasioning the apparent death were beyond the resources of art, it had the effect, when the pulsations of the heart had not ceased entirely, to render them stronger and more frequent, and sometimes even to determine a spontaneous though imperfect inspiration.

I would add, that long continued insufflation seemed to me, in three cases, to be more effectual than is claimed in the above paragraph, for not only did it excite spontaneous inspirations, but the respiration became gradually regular, and existence was prolonged for ten, twelve, and in one case for twenty-two hours, in spite of mortal lesions of the brain. Now it will readily be understood that, in very many cases, the family might attach great importance to twenty-four hours of life in a new-born child.

M. Depaul, who has rendered a real service in calling attention to a measure generally abandoned by some as dangerous, and by others as useless, also proposes some rules of conduct, which I think it right to mention briefly.

He uses Chaussier's canula, dispensing, however, with the lateral openings, and substituting for them a terminal one.

The child, whose temperature is to be maintained by warm coverings, should be placed with the breast higher than the pelvis, and the head thrown a little back, so as to render the front of the neck rather more projecting. Having cleansed the tongue and pharynx from mucus, the forefinger of the left hand should be conducted along the median line of the tongue to the epiglottis. The right hand holds the tube like a pen, and directs its small extremity along the finger to the opening of the larynx, inclines it towards the left commissure of the lips, and by gentle movements endeavors to raise the epiglottis; it is then only necessary to elevate the instrument, carrying it at the same time toward the median line, when its extremity will pass through the glottis. This is the only part of the operation which presents any difficulty, for it is not uncommon for the tube to enter the œsophagus. Before resorting to insufflation, we should make sure of its situation by passing the finger upon the larynx and trachea, and observing whether the larynx follows the instrument when the latter is moved from side to side. However, the first insufflation reveals the error immediately, for when the instrument has passed into the œsophagus, a considerable elevation of the epigastrium precedes that of the base of the chest; if, on the contrary, it is in the larynx, the chest is dilated uniformly, and the epigastric projection is produced exclusively by the depression of the diaphragm.

To prevent the reflux of the air, and to oblige it to enter the air-passages, every point of exit by the œsophagus, mouth, and nostrils should be closed. The anterior wall of the œsophagus is applied against the posterior, by a moderate pressure with the instrument. The lips are pressed closely to the sides of the canula by means of the thumb and forefinger, whilst the nostrils are stopped by pinching the nose between the two middle fingers.

The insufflations should be quite near to each other. M. Depaul thinks that from ten to twelve should be made in a minute. The greater part of the air is expelled after each by the elasticity of the pulmonary vesicles; it may be useful, however, especially at the commencement, to render the expiration more complete, by pressure properly applied with the whole hand on the front of the chest.

The length of time for which it is necessary to continue the insufflations varies much. Thus, there are facts showing that sometimes a quarter of an hour has been sufficient, whilst at others, it was necessary to continue them for three-quarters of an hour, an hour, or even an hour and a half.

When, under their influence, the action of the heart has been so far restored as to be at from a hundred to a hundred and thirty times a minute, I think, says M. Depaul, that the physician should continue until spontaneous inspirations appear, and are repeated at the rate of at least five or six per minute; since to stop after the first one, would in many cases endanger the life of the child. When, however, after having awakened the pulsations of the heart, and even obtained some efforts at inspiration, all become more feeble and disappear, the insufflation may be dispensed with after the lapse of from ten to twelve minutes, for, under these circumstances, I have never known a child to be saved.

It is necessary to withdraw the canula from time to time, in order to clear it of mucus. When the trachea contains much mucus, which is manifested by gurgling, it may be drawn into the tube by suction, and the future insufflations be thus rendered more useful.

When spontaneous inspirations occur, the insufflations may be suspended for the moment.

Finally, all these means having failed, should a galvanic battery be at hand, currents of electricity might be passed through the muscles of inspiration; it is, however, an auxiliary upon which but little reliance can be placed. Electricity has, in fact, much less action upon the fœtus than upon the adult. It has, for example, been proved by experiment, that well-developed fœtal serpents were but slightly sensitive to the action of galvanism before having breathed, whilst shortly afterward they were endowed with a very delicate sensibility.

The same measures should be used in cases of apparent death, in which the children are pale and colorless: here, however, far from allowing the umbilical cord to bleed, it should be tied instantly, even before dividing it.

Some persons have recommended that the umbilical cord be not cut in cases of asphyxia, until after the pulmonary respiration has been fully established, hoping that the continuance of the fœto-placental circulation might replace the extra-uterine one that is wanting. Without admitting, with Dr. King, that this practice, by allowing the contractions of the heart to drive all the blood into the placenta, would expose the fœtus to death from loss of the circulating fluid, I think that in the majority of cases the precaution is, to say the least, useless, and even hurtful, by occasioning the loss of precious time. In fact, the placenta is almost always partly, or even entirely detached, shortly after the child is expelled; and even were this not the case, the retraction of the uterus following its expulsion, has so modified the circulation in the walls of the uterus and that of the utero-placental vessels, that the newly-born infant would certainly find its resources in that direction exhausted.

However, if the touch does not discover the placenta situated upon the neck, and, consequently, there is reason to suppose that it retains its normal relations with the womb, we may, when the fœtus is pale and discolored, defer cutting the cord, especially should it still exhibit pulsations. As soon, however, as the pulsations have ceased, or it is ascertained that the placenta is detached, its section should be practised immediately.

Some children, after having cried and breathed quite freely, fall, after the lapse of several hours, and sometimes even days, into a state of apparent death, which soon terminates in real death unless assistance is promptly rendered. Therefore it is prudent to be carefully on the watch for the first few days. This secondary apparent death may be due, like that just described, to a true asphyxia, or to a deficiency of nervous influence, for which the stimulants employed immediately after birth have proved but a momentary remedy. Asphyxia may be produced either by a foreign body placed over the mouth and nostrils, or by an accumulation of mucus in the fauces. To remove the foreign bodies, and clear out the fauces with the aid of a feather, and the bronchia by exciting vomiting by tickling the palate, are the first measures to be used. If the face is of a violet color, a leech may be placed with advantage behind each ear, or, as recommended by Kennedy, upon the fontanelles. When the accidents are attributable to deficient cerebral action, the excitants already mentioned must again be had recourse to.

Excessive debility of the child, due to some one of the circumstances already pointed out, should be combated by the same means used for apparent death. In those cases where the infant is only very feeble, because it is born before term, or in consequence of a prolonged sickness on the part of the mother, very great care is requisite to maintain a high degree of temperature by surrounding it with cotton wadding and bottles containing hot water, since heat is then the best stimulant.

For the first few days, and sometimes even weeks, its alimentation demands some precaution. It is very important that a nurse should be procured for it as soon as possible, whose milk flows so easily that she can herself project a few spoonfuls into the mouth of the child; for its feebleness is often so great as to render the necessary effort at suction impossible.

It is equally important to give it only the first milk, which being lighter is of easier digestion.

Whenever a child is born in a state of apparent death or of extreme weakness, the accoucheur should, in Catholic families, cause the rite of baptism to be administered immediately. For, whatever the religious opinions of the physician may be, it is his duty to respect the feeling of families, and he would be truly blamable, were he not to yield in this respect to the wishes of the parents.

CHAPTER IX.

OF THE PHENOMENA APPERTAINING TO THE LYING-IN STATE.

THIS term (or that of the *puerperal condition*) is applied to the period immediately following the delivery, during which the uterus and genital organs, and indeed the whole economy, gradually return to their ordinary condition.

The attendant phenomena may be divided into the natural, and the unnatural or morbid, including under the latter head all the diseases to which the lying-in woman is exposed; but the former only claim our attention here.

A feeling of depression, or lassitude, such as that experienced after an unusual or an immoderate exercise, succeeds the agitation caused by the labor; and it not unfrequently happens that the patient has scarcely reached her bed, when she is attacked by a chill, severe enough at times to produce a chattering of the teeth; but this soon passes off, the pulse increases in strength, the heat of the surface returns, the skin becomes humid, a salutary moisture appears, and the various functions are re-established, while the most perfect calm and the most delightful slumber replace the past disorder. Now, although this slumber of the patient is to be respected, nevertheless it is desirable that it should not take place until a few hours after the delivery, unless the physician should be at hand to watch attentively over the state of the circulation, and the condition of the womb during this recuperative repose, because some women have been attacked when in this state with internal discharges, and have awakened exhausted by the loss of blood. Therefore, although on account of the rarity of this accident the patient should not be prevented from sleeping, it is necessary to watch over her during her slumber, or at least to have her carefully observed by an intelligent nurse.

After the first nap is over, she might sit up in bed a few moments to take a little broth, as this position refreshes her, and also facilitates the escape of the lochia that had accumulated in the vagina. The patient is the more enfeebled as the loss of blood has been greater, or the duration of the labor prolonged.

The nervous susceptibility is also highly exalted, and the skin, whose activity was diminished during gestation, now regains a more exalted vitality; it is soft, humid, and is always covered with a dewy perspiration during the first week. This sweat is sometimes very abundant, particularly when she is too warmly covered, and it is not at all unusual to find it followed by a miliary eruption and a distressing pricking sensation. Such eruptions were exceedingly frequent in former times, when it was thought useful to *push the skin*, as it was called, and to make the woman perspire by surrounding her with thick coverlets; now, on the contrary, they are quite rare, and where they do show themselves, are easily made to disappear by taking the necessary precautions to diminish the cutaneous secretion.

[After delivery the pulse becomes softer, fuller, and soon slower. We propose, however, going somewhat into detail in reference to this subject, for the examination of the pulse in newly delivered females is of such capital importance that by simply paying attention to the information which it affords, we are enabled to diagnosticate almost certainly a state of health or of disease. The study of the pulse, therefore, yields extremely valuable information to the accoucheur, but we cannot in this place treat of the indications which it supplies in puerperal diseases, and shall confine our attention to the changes which it undergoes in a healthy woman after delivery.

We would state in the first place, that the mean rate of the pulse in adult women is about seventy-five per minute, and becomes somewhat more frequent during pregnancy (see page 157) and especially during labor (see page 286).

Immediately after delivery the pulse falls to some extent, but the diminution is generally followed in a short time by an acceleration, which lasts for several hours.

In healthy women, this transient acceleration is very often followed by a second diminution in pregnancy. Without attempting to state the exact proportion of cases in which retardation is observable, I will only remark that it is so extremely common as to be found almost constant when sought for carefully.

The diminution in the frequency of the pulse has been well studied and described by H. Blot, in a memoir of which we give an analysis (*Archives Générale de Médecine*, May, 1864.)

The greatest diminution of frequency observed by M. Blot, was thirty-five beats per minute. "But," says he, "it must not be supposed that so great a difference is common,—for I have met with it in but three cases. Between thirty-five and sixty-five beats per minute, the latter of which we regard as the standard, we have observed every grade of diminution. Two numbers, however, forty-four and fifty-six, have impressed us by their relative frequency."

The slowness of the pulse may continue from one to twelve days, generally lasting longer in multiparæ than in primiparæ. In the latter, it rarely continues longer than three days, whilst in the former it is often observed for four, six, and seven days.

The time at which it comes on varies somewhat in different women, though it generally is observable within twenty-four hours after delivery. In the twenty-four hours following its appearance, the slowness of the pulse increases; then, after remaining for a time stationary, gradually gives place to the rate which is habitual to the woman.

The slowness diminishes and sometimes even ceases entirely as soon as the breasts experience the congestion which precedes the secretion of milk. Usually, however, the pulse gradually becomes more frequent. We shall have occasion to revert to this fact when we come to treat of the secretion of the milk and what is known as the *milk-fever*.

The slowness occurs also after abortion and after premature delivery, whether spontaneous or artificial.

When the slowness of the pulse is observed in a newly delivered woman, we may feel sure that she is in a perfectly normal condition, so that in respect to the prognosis it is an extremely favorable sign.

In a lying-in hospital, the frequency of the diminution of the pulse in proportion to the number of puerperal women indicates, in a general way, an excellent sanitary condition: its rarity, on the contrary, should excite our apprehension of an unhealthy tendency in the newly delivered inmates.

The cause of this slowing of the pulse is obscure. It would seem, however, from the sphygmographical experiments of MM. Blot and Marey, that, like the diminution of frequency under all circumstances, it is connected with a certain increase in the tension of the arteries, which tension the authors just quoted think may be explained by the sudden and almost entire suppression of the circulation which existed in the uterine walls during pregnancy. When the uterus contracted, the blood which previously traversed it accumulated in the arterial system, from whence resulted a greater tension which became in its turn an impediment to the ventricular systole, giving rise to the temporary diminution in frequency of the pulse, followed by an establishment of equilibrium.

Whatever the explanation, the fact is both established and shown to be of great clinical importance.]

Let us now study the important changes which take place in the genital organs. To the hypertrophy which characterizes the pregnant condition succeeds an atrophy which, during the puerperal condition, restores the uterus to its normal state.

If the relaxed walls of the abdomen be examined after delivery, the womb is felt above the pubis as a large tumor, which henceforth diminishes in size. In thin women, particularly those who have often had children, the womb still remains at the end of two weeks about two fingers' breadth above the pubis, yet the fundus in primiparæ, more especially in such as are at all inclined to embonpoint, cannot be distinctly felt after a week; and by the end of the sixth week this organ has nearly regained its primitive condition, being still, perhaps, a little larger than usual.

[The diminution of the bulk of the uterus, its atrophy, so to speak, has been studied so carefully by Dr. Wieland, who noted its progress day by day, that we think we cannot do better than quote some portions of his excellent thesis, which are of interest in connection with the subject under consideration.

At the commencement of labor, the organ has generally an elevation of from eight to nine inches above the pubis, and from six and a half to seven and a half inches in width. When the clots which follow the exit of the placenta are expelled, the uterus is found to have assumed a spheroidal form, and is hard, resisting, and contracted. Its vertical diameter is then only about from four and a half to five inches, and its transverse diameter from three and a half to four inches. After about half an hour and during the first few hours succeeding delivery, its size increases somewhat,—(vertical diameter, five to five and a half inches; transverse diameter, four and a quarter to four and three quarter inches;) but thereafter it diminishes gradually and almost uniformly. On the second day the decrease in the diameters amounts to from three-eighths to five-eighths of an inch, the vertical then being often rather less than the transverse. On the third day, in most cases, little change is observable except in women who have had in the interval of the two last examinations severe after-pains, accompanied by an abundant lochial discharge when the contraction takes place. Dr. Wieland observed that until the middle of the fourth day the size of the uterus was unchanged but seemed softer and less regularly rounded in form, and that this inactive condition always coincided with the commencing lacteal secretion. From the end of the fourth day the retrocession of the organ progressed regularly and continuously. The distance which then separates the uterus from the pubic symphysis varies from two and three-eighths to two and seven-eighths of an inch, and in exceptional cases only is it less.

During each of the following days the observed difference varies from three-eighths to three-sixteenths of an inch.

By the sixth day the uterus has become hard, its anterior surface less convex, and its fundus reaches from an inch and a half to two inches above the superior strait. Usually not before the tenth day, and sometimes not until the eleventh, has it disappeared behind the symphysis pubis; but even then, if the abdominal walls are very thin upon the median line, the fundus may be felt in the pelvic cavity by pressing downward with the bent fingers.

During all this time the tendency of the womb, which in the majority of cases (79 in 100) is situated to the right, is to resume its position in the median line.

The organ, however, is far from having attained its primitive condition, even when the hand is unable to feel it through the abdominal wall; and its state can be determined only by the vaginal or rectal touch.

The laxity of the ligaments, the mobility which it still retains, and its diminished size, cause it to settle into the excavation, so that its inferior segment, still considerably developed (being nearly an inch and a half or two inches in diameter), depresses the vaginal cul-de-sac. The neck is lower down in the vagina, and the posterior surface of the organ is felt to be hard, convex, and of a size which can only be approximatively determined. The absorption seems now to go on more slowly, so that no sensible difference can be perceived for eight or ten days longer. By this time its volume is slightly lessened, there is less depression of the vaginal cul-de-sac, and it is more movable. Finally, in women whom I examined three months after delivery, the original condition, as respects situation, form, direction, consistency, and mobility, seemed to be restored, the size only appearing to be somewhat greater. In no case had it resumed entirely its primitive condition either by the sixth week or the second month. (Wieland.)]

The rapidity with which the uterus after delivery tends to resume the volume and dimensions which it possessed before impregnation, is, to say the least, quite as surprising as the rapidity with which it underwent its enormous hypertrophy during gestation. An examination of the various changes through which this rapid absorption is effected, induced M. Retzius, of Copenhagen, to conclude that it is preceded by a fatty degeneration of the muscular fibres. The same observations have also been made by Kolliker.

This diminution in the size of the uterus is not always so regularly graduated as described, for when the contractility of the tissue has been feeble after delivery, the walls of the uterus often preserve a considerable thickness for four or five days, the fundus being found all this time close up to the umbilicus. The same observation may be made at a still later period, in cases where an inflammation of the peritoneum, of the uterine mucous membrane, or of the neighboring organs has supervened. Again, it happens that after having been diminished, its volume augments anew, for some hours, at times, even for a day or two, and then soon returns to its former size. I can explain this circumstance only by supposing some local congestion, which has not been acute enough to produce an active hemorrhage, but whose action has been limited to distending and engorging the uterine vessels, and consequently to increasing the thickness of the walls; or this abnormal volume may be owing, in certain cases, to the presence of newly formed coagula. But, however that may be, I felt bound to point out these anomalies, to prevent the inexperienced practitioner from falling into error.

[The internal surface of the uterus after delivery, has lately been studied carefully by MM. Colin, Robin, Pajot, and Béhier. Two parts, dissimilar in appearance, may be distinguished in it; one of these, which is extensive, was in relation with the decidua during gestation; the other, having a lesser surface, presents traces of the insertion of the placenta. We have next to study these two parts in succession.]

A few hours after delivery, says M. Colin, the internal surface of the womb is covered with clots of blood, which, upon being removed, discover a soft, moist, reddish layer, lining the whole internal surface of the uterus, except where the placenta was attached. If the surface be scraped with the blade of a scalpel, a layer varying in thickness from the one-eighth to the one-sixteenth of an inch may be raised from it. This layer, which increases in thickness towards the middle and fundus of the organ, is of a reddish-gray color and friable, tearing like a newly-formed pseudo-membrane, and even giving way beneath the fingers. Below it is found the muscular tissue, of a white or grayish appearance, entirely distinct from this layer, and easily recognized by its clearer hue, the appearance of fibres and their transverse direction, as also by its greater consistency.

It is now demonstrated that this membrane is formed by a new uterine mucous membrane in process of regeneration from the fourth month of gestation. (See page 177.)

At the upper boundary of the cavity of the neck, this membrane is terminated by an irregular edge projecting above the latter, and from which are put forth small shreds or laminæ, from one to three-sixteenths of an inch in length, of the same nature as the layer covering the wall of the uterus.

The cavity of the neck contains a glutinous, transparent, and slightly-reddish mucus. The color of its internal surface varies greatly according to the mode of death, from a reddish-gray to a blackish-brown. The thickness of the mucous membrane lining the cavity of the neck varies from the one-thirty-second to the one-sixteenth part of an inch; it is very moist and flexible, although firm and torn with difficulty. It remains intact, and does not participate in the exfoliation which that of the body undergoes.

The condition of the mucous membrane at a period still more remote from delivery, has also been studied by M. Colin. Not until after about the ninth day are epithelial cells found upon the surface of the uterine mucous membrane in process of restoration. Until the twentieth day its tissue is composed chiefly of fusiform bodies, nuclei, and granules; glands and numerous capillary vessels are found in it about the twentieth day. Thus, from the twenty-eighth to the thirtieth day, the membrane has assumed a rose-red or grayish color, especially in the vicinity of the neck; it is smooth, moist, and soft, but resists the action of a stream of water, though it may be scraped off entirely by the scalpel, so as to expose the muscular fibres. Numerous vessels, whose greatest diameter does not exceed the one-ninetieth part of an inch, proceed from the muscular tissues and ramify *ad infinitum* in its substance. By the fortieth day, the membrane is of a rather deep-red color, opaque, and of about the one-thirty-second part of an inch in thickness, toward the fundus; it is semi-transparent and thinner in the lower part of the body, where it is continuous with the mucous membrane of the neck, which presents no peculiarities. It is soft, and easily removed by the back of a scalpel. It is traversed by a very close network of capillary vessels. By the sixtieth day, it is smooth, gray, and supplied with small vessels; it has the true consistency of a mucous membrane, and the scalpel removes from it but a slight pellicle, which has no longer the pulpy appearance of the substance detached from it at an earlier period.

This new mucous membrane, which, according to M. Robin, begins to be formed by the fourth month of gestation, is, therefore, after delivery, the seat of a reparatory process, which ends in the completion of a new mucous membrane. The mucous membrane of the neck is not thrown off; it is simply hypertrophied during pregnancy, and after delivery continues to exhibit the arbor vitæ, though of a somewhat modified form.

The point of attachment of the placenta is marked by an elevation, presenting to the view a surface mammillated, rounded, anfractuous, and projecting to the extent of a quarter of an inch above the level of the surrounding surface. The anfractuosities are filled up with coagulated blood, which is removed from them with difficulty. It is the placenta wound.

These inequalities, which have been regarded by some anatomists as tufts destined to dip down between the cotyledons of the placenta, are due, according to Desormeaux, to the excessive distention which the arteries and veins, the last especially, have undergone during pregnancy, and upon the slowness of their subsequent retraction; though, according to Velpeau, they are owing, in women that die shortly after delivery, to the swelled and fungous character of that portion of the internal uterine surface which corresponded to the placenta. We prefer the following explanation, given by M. Jacquemier, viz.: the internal muscular layer of the womb is perforated in all the space occupied by the after-birth, by a great number of holes, which give a peculiar aspect to this portion of its inner surface, and render it less contractile than at other parts; and consequently, as the organ retracts, it has a tendency to project into its cavity, and when it arrives at the final state of repose, a tumor is formed, which is ordinarily larger than the palm of the hand, with a very irregular lacerated surface, spongy, as it were, in character, and often standing out in considerable relief; the torn utero-placental vessels are comprised in this mass, which renders them tortuous and nearly inextricable. But whatever the explanation may be, it is highly important, adds M. Jacquemier, to bear this arrangement constantly in mind, for an attentive perusal of several cases of artificial delivery of the after-birth has convinced me that, in those instances, the tumor formed by the most internal layer of the womb was mistaken for debris of the placenta, which the medical attendants endeavored ineffectually, though not without danger, to extract.

[Robin has shown that this projecting portion is formed simply by the utero-placental mucous membrane, which remains adherent to the uterine wall, with the exception of the thin superficial layer which was carried away by the placenta. (See *Decidua*, and *Placenta*.)

The retraction of the uterus after delivery diminishes greatly the superficial extent of this part of the mucous membrane, being soon reduced to a diameter of from two and a half to three and a quarter inches, and so progressively. At first it was circular in form, but soon becomes irregularly oval, with the greater diameter corresponding with the longer diameter of the uterus. What it loses in length, however, it gains in thickness by the contraction of the organ. A few days after delivery, it has a thickness of from five-eighths to six-eighths of an inch, and in some places even more. At the same time, its surface becomes folded and roughened, and its substance brownish or reddish; it also softens gradually, and assumes a pultaceous or mucous consistence. Its projecting and irregular edges are continuous with the thin, newly-formed mucous membrane which lines the remainder of the uterus.

It is not uncommon to find on the surface of the part just described vascular orifices plugged up by reddish or bleached clots, and if the latter be traced by dissection into the deeper parts of the membrane, they will be found to lead into the subjacent uterine sinuses. The cavernous appearance given to this layer by the membranous anastomoses of its vessels is very striking, and one cannot but observe at the same time that its thickness and the projections which it forms upon the internal surface of the uterus are principally due to the clots which fill and distend the sinuses to a greater or less extent. If the latter be emptied, the intervals between them will become very slight.

The clots lose their color and lessen gradually, but they are still found up to the twentieth day after delivery, and often much later. The tissue of the serotina itself atrophies, and finally becomes continuous with and indistinguishable from the newly-formed mucous membrane. In some women, however, the mucous membrane remains for several years both thicker and more projecting at this point than elsewhere. It was a mistake, therefore, to suppose, as has been heretofore done, that the serotina is carried away with the placenta, or that it is exfoliated and eliminated during the continuance of the lochial discharge. (Robin.)

In autopsies of puerperal fever cases, the layer, with a reddish, flocculent, blackish and pultaceous appearance, formed by the serotina, has often been mistaken by persons not fully acquainted with what had taken place previously, for portions of the placenta remaining adherent to the uterus, and then in course of decomposition.

To recapitulate: At the moment of labor there is already present a newly-formed but very thin mucous membrane between the muscular layer of the uterus and the parietal decidua. The new membrane makes its appearance at the fourth month, but does not continue to grow between the muscular layer and the utero-parietal mucous membrane. Finally, when the placenta is detached, the greater part of the serotina remains adherent to the uterus. This utero-placental mucous membrane does not, therefore, deserve the name of decidua, inasmuch as it continues and diminishes gradually in thickness until its surface corresponds with that of the recrudescent mucous membrane.]

Professor Stoltz has studied the modifications that occur in the neck of the uterus, after the delivery, with a great deal of care, and we extract the following passage from his excellent thesis on this subject: "As soon as the child is born, the cervix is partly formed anew, but it is soft, short, wide, and irregular, and one or more fingers can easily be made to penetrate it; the internal orifice offers the greatest resistance, as is proved when an attempt is made to introduce the hand into the womb, for it enters with considerable difficulty, and only when this orifice has been progressively dilated. The latter is sometimes so contracted as to induce inexperienced persons, who endeavor for the first time to carry the hand up into the womb, to believe they have succeeded, when in fact they have only reached the dilated vagina, where they find a large cavity, but no opening to get any further, and the clots of blood, then collected at the upper part of the vagina and around the cervix, add still more to this confusion."

The internal orifice, formed after the expulsion of the child, offers but little resistance; and, consequently, it has scarcely occasion to dilate again for the passage of the placenta, as it yields readily; and when the delivery of the after-birth is effected, the womb contracts, and the neck becomes longer and more consistent; although it must again open several times to permit the numerous clots of blood to escape. During the lying-in, it gradually returns to its natural size; sometimes, even, it is longer; but it acquires the ordinary disposition more or less, as it regains its proper consistence, and by the end of the first month it generally exhibits about the same dimensions as it had prior to gestation; at times, however, it is a little shortened, and the consistence is nearly as firm as usual, although the inferior part has seemed to us rather more softened. It no longer presents a conical shape, but is more cylindrical, from the fact of the summit having become larger. As a general rule, the scars on the lips are proportionably more numerous as the patient has had a greater number of children, and her labor has been more tedious. The transverse fissure is deeper and more angular; and, in such women, the upper part of the cervix is sometimes larger than the base, though it is much shorter than usual, and at times is divided into two lips that are more or less flat, broad, and unequal, and the anterior of which is longer than the posterior; indeed, in some cases the latter seems to have been altogether destroyed, while in others it is well marked, and the anterior one is scarcely perceptible. In fact, almost as many varieties exist on this point as there are different subjects.

The vagina becomes shorter, and the ridges that were effaced during the last stage of labor, gradually but slowly reappear, and the orifice of this canal, and the vulva, also regain their primitive condition. At first, the labia externa, as well as the perineum, are thin and distended, and the posterior part of the contour of the vulva is flabby, wrinkled, and projecting outward. Sometimes the epidermis is fretted, at others, actual lacerations are found, which produce a smarting sensation; and as to the fourchette, it is almost inevitably torn in the first labor.

The broad ligaments seem to re-form by the approximation of their two constituent layers, while the round ligaments gradually become shortened and retracted.

The abdominal muscles and integuments, which were at first soft and flabby, and exercised but a very imperfect pressure on the viscera and vessels contained in their cavity, again retract; although this process is very often incomplete in women of a soft fibre, or who have had many children.

This slow and gradual retraction of the uterus takes place, in some instances, without the least pain, and without the knowledge of the patient; but it more generally becomes intermittent and distressing, and as the sufferings the women then experience have a great analogy to those of childbirth, they are called the *after-pains*. At the same time, a more or less abundant discharge takes place from the vulva, consisting at first of pure blood, then of blood mixed with a white fluid, and, lastly, of a white seropurulent liquid; and these discharges have received the name of the *lochia*. Finally, a function altogether new sets in, in the course of the first few days, which may be considered as the complement of the puerperal functions;

this is the milk secretion, whose onset is attended by certain general phenomena, which are ordinarily described under the term of the *milk fever;* we shall therefore have to examine, in turn, these three principal phenomena of the lying-in state.

§ 1. OF THE AFTER-PAINS.

The after-pains are certainly occasioned by the contraction of the womb; to be satisfied on this point, it is only necessary to place the hand over the hypogastric region, when we will ascertain that the uterus becomes harder just at the moment when the patient complains the most. These pains are much more frequent and intense in women who have borne many children than in primiparæ; as, also, after an easy than after a long and painful labor; and when the womb incloses some foreign body, such as coagula, or a portion of the membranes or placenta, than when its cavity is entirely empty. Now, all these differences in character will be readily comprehended, if the reader will only bear in mind that the object of the contractions is to express from the uterine parietes those liquids with which the walls are still engorged after the delivery, and to expel from its cavity all the foreign substances contained therein; that, in very prompt labors, the organ, from being evacuated too rapidly, does not retract so perfectly as it ought, and allows the blood to coagulate and accumulate in its interior, and that the very feeble contractility of its tissue forces out but very imperfectly the fluids remaining in the thickness of the walls.

The pains generally commence soon after the delivery, being at first feeble and distant, then more frequent and painful; and, at the moment of their occurrence, the uterine globe retracts, becomes harder, more resistant, and sometimes even seems to rise up, by resting on the posterior plane of the abdomen, as a *point d'appui,* and projecting in the form of a globular tumor through the walls of the abdomen. The escape of the lochia is ordinarily more abundant towards the end of, or just after each pain, and not unfrequently a few small coagula come away from the vulva; but where the uterus contains a large one, the pains constantly increase in force and frequency, until it is expelled, after which they again diminish. In most cases, they cease during the milk fever, though they may continue for the first seven or eight days. They are very commonly excited by putting the child to the breast. Sometimes they return after having entirely disappeared, are followed by the discharge of a little blood from the vulva, or the expulsion of a clot, or of a portion of membrane that has remained in the uterus, and then everything returns to its natural condition. They are sometimes so severe as to extort cries from the patient, and some women insist that they suffer more from them than from the labor pains.

As regards the diagnosis, it is highly important to distinguish the after-pains from those caused by peritoneal inflammation, but fortunately this is not very difficult; for however strong the after-pains may be, they are generally intermittent, and are separated by an interval of variable duration; besides, the distress attendant upon them is rather alleviated than augmented by pressure, and a rather more abundant lochial discharge accompanies or follows them. While they last, there is an absence of febrile movement;

finally, when the child seizes the nipple, especially if the latter is the se of any ulceration, the suffering thereby caused most frequently brings on a after-pain, and this circumstance alone has often sufficed to make them reappear, even after a suspension of several hours. When existing, these differential characters are quite sufficient to distinguish them, but unhappily they are not always so well marked; for, where they are very acute, or follow each other in rapid succession, they are accompanied by fever and sharp pains in the hypogastrium. But even then, there is always a remission, which, conjoined with the absence of the other signs of peritoneal inflammation, may aid in determining their character.

Dr. Dewees states that he had several times an opportunity of observing a singular pain which was manifested almost immediately after the delivery, and yet was altogether different from the ordinary after-pains. It is a very acute pain, referred by the patients to the lower part of the sacrum and coccyx. It commences as soon as the child is born, and continues without interruption, and of a frightful intensity. It is declared by the patient to be vastly more insupportable than the after-pains, for it is quite as violent, besides being constant; the latter character serving as a ready means of distinguishing it. Camphor and opium appeared to him the most successful means of relieving it.

The after-pains, of which we have just spoken, are sometimes so severe as to claim the attention of the physician, and although they may be useful when caused by the retention of a foreign body, they are so annoying, tha it is certainly advisable to endeavor to prevent them. Dewees states tha this may often be effected by observing the following precautions: 1. D not rupture the membranes before the neck is completely dilated; 2, aft the head is born make no tractions, but allow the uterus to expel the sho ders and trunk; 3, do not extract the placenta until the womb is thorough contracted; 4, after the placenta is delivered, excite the womb so as to obli the muscular fibres to contract as much as possible. It is evident that these measures have for their object to insure the slow and complete co traction of the walls of the uterus, in proportion as its contents are expell

In the cases of women who have suffered much from after-pains in p vious confinements, I have made it a practice to administer a few doses ergot immediately after delivery, with the effect, I have thought, of pr venting their occurrence in many cases, or at least of lessening their violenc When the womb contracts feebly, it has seemed to me of advantage to ad pressure upon the uterus to the use of the ergot. This is done by means o the ordinary bandage, and made more effectual by placing a compress, forme of one or two folded towels, upon the fundus of the organ.

If the after-pains are feeble, nothing need be done; if, however, they a very violent, the physician should interpose. Provided the patient has n suffered from hemorrhage, or been threatened with it, we may begin b placing warm and emollient cataplasms upon the abdomen. Lotions co taining laudanum may be used upon the belly, and the cataplasm may b wet with the same substance. An injection may also be given of fro twenty to forty drops of Sydenham's laudanum, in as small an amount o vehicle as possible. Dewees professes to have derived great advantage fro a camphor mixture, consisting of a drachm of camphor to six ounces of vehicle, a tablespoonful to be taken every hour or two. When the mixture disagrees with the patient, ten grains of finely-powdered camphor, every hour or two, mixed in a little syrup of any kind, may be substituted for the julep just mentioned. When the after-pains are accompanied by signs of general plethora, blood may be taken from the arm. Finally, should there be cause to suspect the presence of large clots or portions of the membranes in the cavity of the uterus, one or two fingers may be introduced within the neck, in order to seize them, or at least to bring about their expulsion. These are, perhaps, the only circumstances under which the use of ergot, so highly vaunted by Crozat and Velpeau as a remedy for after-pains, is likely to be successful.

§ 2. Of the Lochia.

Of all the various excretions that take place after the delivery, the lochia are certainly the most interesting to us as practitioners. This name is applied to the matters that escape from the vulva during all the period from the delivery of the after-birth until the womb has regained its normal size and consistence. Immediately after the delivery of the placenta, and the escape of the accompanying blood, all further sanguineous discharge becomes temporarily suspended, probably because the blood that transudes from the surface of the womb accumulates in the cavity of that organ; but the pure fluid soon begins to flow again, although, in the course of twelve or fifteen hours, it loses its consistence, and its color becomes lighter, and after a short time it is changed into a bloody serosity. At the expiration of the first day, the fluid secreted contains only about one-third part of red globules; the other elements consisting of white globules in rather smaller proportion, and very numerous epithelial cells. The suspending fluid is sprinkled with grayish molecular granules and granulations of fatty matter. After the second day, the proportion of white globules increases, and the red ones diminish or even disappear. The secretion of milk soon commences, and then the flow of the lochia is either diminished or entirely suspended. When it is over, the bloody discharges reappear, and continue during the four or five succeeding days, though with characters varying greatly in different individuals: thus, in some women, those especially who menstruate profusely, they appear with the same characters, quantity excepted, as before the milk fever. They are still composed of pure blood, which sometimes contains numerous small clots; with the majority, however, they become more and more serous, though still exhibiting here and there some bloody streaks, or perhaps are slightly tinged by the blood, the quantity of which diminishes every day. It usually disappears altogether about the eighth day; the lochia being thenceforth composed of a more or less consistent yellowish-white liquid, and they thus continue for two or three weeks or a month; though in some women, who do not nurse, they do not pass off until the menses reappear, that is, in about six weeks or two months after the delivery.

These discharges have been divided, according to their color, into the *sanguinolent*, the *serous*, and the *milky*, *puriform*, or *purulent* lochia. As the uterus retracts, its walls gradually disgorge the fluids they had imbibed, and these naturally run towards its central cavity. So long as the large venous canals in its substance are not empty, the discharge consists of pure blood; somewhat later, it is composed of serum, together with the detritus of the ovum and the mucosities of the organ; and still later, a true suppurative irritation is established, the products of which, analogous in some respects to the non-contagious discharges of the urethra, constitute, in a great measure, the white or the purulent issue.

The lochia have a peculiar odor, called *gravis odor puerperii*, which varies in strength according to the individual and her habits of cleanliness; and to this is also added the scent from the perspiration and the milk, which latter, distilling from the breast, is imbibed by her garments and turns sour. Sometimes the lochia become fetid, and where this circumstance is not owing to slovenliness, it is always an unfavorable sign, since it most generally announces that coagula or some other foreign substances are putrefying in the uterus; and where the lochial fluid has the color of coffee-grounds, and a cadaverous smell, it is almost uniformly an evidence of the existence of an inflammation of the womb or vagina, which has terminated in gangrene. Again, whenever the patient is afflicted with carcinoma uteri, the discharges resemble the washings of flesh, and have a very nauseous smell. In all such cases aromatic injections, infusions of elder or chamomile flowers, which are rendered more useful by adding some disinfecting fluid, should be made several times a day.

The lochia are also very variable in quantity and duration, though we may state, as a general rule, that the patient soils ten or twelve napkins in the course of the first twenty-four hours, eight on the second day, six on the third, four on the fifth, and two on the following days. After the milk fever is over, the flow diminishes more and more, its amount being usually proportionate to that of the menstrual evacuation. It is more copious in women who have borne many children, or who make use of an overnourishing or a heated regimen, and in those who do not nurse. The sanguineous discharges vary much in amount during the first days, according to the force of retraction with which the uterine walls were endowed immediately after or during the delivery of the after-birth; thus, at times, they are very copious, frequently coinciding with a considerable development of the organ; and in such cases I have known the womb to continue as high up as the umbilicus for several days after the delivery.

This condition, which Leroux calls humoral engorgement, depends, in his estimation, on the fact that the vessels and pores of the womb, from being distended with blood, do not become empty as soon as usual, because the contractility of tissue is not then active enough to expel it; for the walls of the uterus constitute a true sponge, whose meshes are composed of muscular fibres, and which must retract forcibly so as to express all the liquids contained in the vessels and vacuities which they form; hence, if this contraction is not strong enough, the parietes remain engorged, and preserve an abnormal thickness, which singularly augments the whole volume of the uterus, although its cavity may be entirely effaced. Soon, however, the contractile action of the tissue is aroused, and the muscular fibres forcibly compress and flatten the vessels that ramify between them, and thus force the liquids which had hitherto remained there to discharge into the cavity of the organ, whence they flow towards the exterior in considerable quantities. This discharge might very readily be mistaken for a flooding, occasioned by a retention of some part of the after-birth, or of voluminous coagula, the more especially as it is accompanied at times by sharp after-pains; but if one finger can then be introduced into the uterus, the accoucheur will ascertain that it contains no foreign substance, and by placing the other hand at the same time on the hypogastric region, he will easily satisfy himself that the unusual size of the organ depends only on the engorgement of its walls. In these cases, there is nothing to be done, as the sanguineous discharge is itself the best remedy; for it slowly empties the uterine texture, diminishes the after-pains, and the womb gradually returns to its normal size.

This slowness of the retraction also prolongs the flow of the sanguineous lochia, and the same result is observed whenever one of the layers of the uterus or its enveloping cellular tissue is affected with inflammation. Indeed, we can readily understand that from this sluggishness of the uterine fibres, this defect of reaction, as Leroux called it, to a more or less perfect inertia of the womb, there is but a single step, and that a secondary hemorrhage might result from the absence of contractility, if it were carried to the extent of relaxation.

[The time at which the lochia assume a purulent form is also liable to remarkable variations. In thirty-seven cases observed by M. Béhier, in which everything was favorable, it occurred on the third day nine times, on the fourth day four times, on the fifth day ten times, on the sixth day six times, and from the seventh to the tenth day seven times. Finally, in one case, in the most auspicious condition, the lochia became decidedly purulent only on the sixteenth day. (Béhier, *Clinique Médicale.*)]

Lactation lessens the duration and amount of the lochia. Some women have them for a few hours only (Van-Swieten), and others have none at all (Millot). An instance of the latter kind came under my notice quite recently (1855), in the case of the young wife of a medical friend. After an easy and happy labor, the lochia were almost completely suppressed. She hardly lost a few spoonfuls of blood within the first twenty-four hours; after the second day there was no discharge whatever, and the husband, who examined the linen daily with the greatest care, assured me that he was unable to detect the slightest evidence of lochial discharge. Everything went on well during the lying-in, with the exception of a very fetid odor from the genital parts during the first seven or eight days. After satisfying ourselves that there was no foreign substance in the uterus, we recommended the use of injections, frequently repeated, and all passed off well. This young lady had been delivered once before, on which occasion she had a perfectly regular lochial discharge.

In a case observed by Bruckmann, and quoted by Velpeau, the lochia were substituted by hæmatemesis.

In some instances, the sanguineous lochia are prolonged far beyond the usual term; while in others they reappear at various intervals, but this latter circumstance, in the absence of inflammation of the uterus or of its appendages, is ordinarily owing to some error in regimen, more especially to getting up too soon; and, therefore, the best plan is to persuade the patient to remain in bed. In the course of a short time the lochia cease their continual flow, and intervals of several hours of duration are observed at first, then of a day, and sometimes of two days.

When, in spite of this precaution, the bloody discharge continues for two or three weeks after labor, its cause should be sought for in a local alteration of the uterus and of the neighboring parts, or else in the general condition of the patient. Thus, it is not unusual for it to be kept up by a circumscribed peritoneal inflammation, an inflammation of the uterine mucous membrane, a chronic or acute engorgement of one or both ovaries, or a phlegmon of the broad ligaments, of the iliac fossa, or of the cellular tissue surrounding the uterus.

It is important to diagnose these various affections from the outset, as it is they which should be attacked, in order to stop the discharge, which is here but a symptom of the disease.

The continuance of red discharges is connected, perhaps, more frequently with ulcerations of the neck of the uterus, having their origin in many cases in the lacerations which occur during labor, and the cicatrization of which is prevented by circumstances which elude our detection. When, therefore, it is certain that no symptom of engorgement or inflammation in the pelvic or hypogastric region is present, the patient should be examined with the speculum, taking care to separate the lips of the neck with the valves of the instrument, when very often a fungous and bleeding ulceration will be discovered either within the cavity of the neck or upon the os tincæ. The only means of arresting the discharge consist in cauterizations with nitrate of silver or acid nitrate of mercury, and even, if the fungosities are very projecting, with the actual cautery. In some cases, it is necessary to repeat the cauterization several times.

Amongst the causes of these anomalous lochial discharges, should be reckoned a local irritation sustained by obstinate constipation. Here the use of purgatives is demanded.

Sometimes no lesion can be discovered, but the discharge seems evidently to be connected with an over-excited condition of the entire organism. This condition is indicated by heat of the skin, fulness of pulse, some febrile movement towards evening, and disturbed sleep. Notwithstanding the apparent weakness of the patient, great care should be taken in reference to the use of tonics, which, unfortunately, are too often employed; a moderate antiphlogistic treatment, on the contrary, is the one indicated. A small bleeding from the arm, mild laxatives, and a restricted vegetable diet, might be directed with advantage. Stimulating or even tonic drinks should be proscribed, and only after the general irritation shall have been quieted, is it proper to endeavor to increase the strength of the patient by the appropriate means.

In some rare cases, however, the abundance and persistence of the bloody discharge seem to be sustained by the general debility. The absence of the general symptoms, just now mentioned, allow of recourse being had immediately to a tonic treatment; then it is that infusions of cinchona and sulphate of iron are capable of rendering effectual services. (See in Part Fifth the article devoted to *Secondary Hemorrhage.*)

The white or purulent lochial discharges sometimes become very profuse, and have at the same time an exceedingly disagreeable odor. The discharge is no longer covered with blood, but appears as a reddish water flowing in large quantity, and sometimes even escaping in gushes. They are occasionally so acrid as to inflame the parts over which they flow. The patients are almost always much weakened by the evacuation, and their general health evidently demands the use of tonics. The irritated parts should be washed frequently with warm water, and injections of infusion of chamomile flowers, afterwards made rather more astringent, should be thrown into the vagina five or six times a day. A few spoonfuls of chloride of soda might be added with advantage. My friend, Dr. Casaubon, informs me that he has met with several cases of this kind.

These purulent lochia, also, sometimes continue long after the usual period of their cessation. This circumstance is sometimes connected with some one of the causes mentioned as productive of the anomalous persistence of the bloody discharge, though it has oftener seemed to me to be the result of a catarrhal metritis or peri-uterine phlegmon. Both these affections may hinder the gradual retraction of the uterus, which may remain of considerable size for a month or six weeks after delivery. Large flying blisters upon the abdomen, frequent alkaline baths, and bleeding from the arm, when there is fever and the strength permits it, have appeared to me to be the most effectual under these circumstances.

The suppression of the lochia long before the time at which they usually disappear is an unfortunate symptom only when it seems to be connected with the development of a serious inflammatory affection, or when it is replaced by a supplemental hemorrhage. It then merits the closest attention of the physician; but when the contrary is the case, there is no occasion for uneasiness, since it is the evidence of a rapid and forcible contraction of the uterus, which is a favorable circumstance.

§ 3. OF THE MILK FEVER.

One of the most important phenomena appertaining to the lying-in state, is that usually designated under the name of *the milk fever*. It has already been seen, when studying the modifications impressed on the whole organism by gestation, that the breasts in most women, even in the very commencement of their pregnancy, are apt to become tumefied, that the swelling persists, and that sometimes they become the seat of an abundant secretion long before delivery. After the delivery, they yield on suction a liquid of a yellowish color, and somewhat more consistent than the preceding, which in some women escapes during the latter months of gestation. This fluid has a sweetish taste, and is called the *colostrum*. It retains these qualities for twenty-four hours; but becomes whiter after that period. In the course of forty to sixty hours, the breasts enlarge greatly; the subcutaneous veins, seen through the skin, are more swollen than during the pregnant state, and the former become manifestly harder. The secretion of milk in healthy women is not usually attended with fever, the diminution of the pulse hardly being prevented by it (see page 422.) Still, if the swelling of the breasts be considerable, headache may occur, as also, at times, though more rarely, slight shiverings, or heat and dryness of the skin, which is succeeded in a few hours by a copious perspiration; there are thirst and loss of appetite; the tongue is slightly furred; the pulse, at first small and contracted, soon becomes full, soft, and accelerated; and the face is flushed and animated. M. Pajot maintains that the pulse rarely rises above 100, which is generally true, though there are exceptions due to individual susceptibility. M. Béhier has noted the pulse at 130 in a case in which everything went on very favorably. During this febrile movement, which is generally slight, the enlargement of the mammæ continually increases, extends as far as the armpits, and involves the surrounding cellular tissue, whence the patient can no longer bring the arms down alongside of her body, and therefore has to hold them off. The skin is sometimes so stretched as to become painful and incommode the inspiratory movements of the chest; and lastly, as elsewhere stated, the discharge of the lochia either disappears altogether, or else is greatly diminished. This fever lasts for twelve, twenty-four, thirty-six, or possibly forty-eight hours, and then is followed by a calm; at times, however, it is continued for three or four days; but in such cases it is often due to a deep-seated inflammation, or else soon exhibits a well-marked intermittence, and may degenerate into a true intermittent fever, which yields readily to sulphate of quinine. The pulse is ordinarily not very rapid, and whenever it exceeds 100 per minute, the cause should be sought elsewhere than in the lacteal secretion.

Authors have stated that the milk fever is less intense with primiparæ than with others. The same is the case with those who begin to suckle their children very soon after delivery; indeed, it is not at all uncommon for the latter to escape it entirely. Finally, certain females, even of those who do not nurse at all, have no milk fever whatever, and this notwithstanding that the breasts are considerably swollen and the secretion of milk is abundant. This is a much more common occurrence than is generally supposed, and I have frequently had occasion to point it out to students. Still, I am far from supposing, as some do, that it forms the rule, and from regarding every febrile movement occurring in a lying-in woman, even when the lacteal secretion is commencing, as indicative of an apparent or concealed inflammation. Nothing, indeed, could be more reasonable than to regard the swelling and painfulness of the mammary glands as the cause of the general reaction which usually accompanies them, and which diminishes or ceases, as soon as the breasts become soft, or the system habituated to the new condition of things.

In some women the breasts remain inactive, and no milk it secreted; it really would seem, as Prof. P. Dubois has remarked, that nature has left her work unfinished in them; that, being capable of becoming mothers, and able during the whole term of gestation to furnish the necessary materials for the child's nutrition, yet their organization is absolutely inadequate to supply its wants after birth. I have at this moment under observation a young primiparous woman, convalescing, it is true, from an attack of varioloid which came on immediately after delivery, who has not had a single drop of milk.

The milk fever generally manifests itself about forty-eight hours subsequent to the delivery; at times a little sooner, at others somewhat later; thus, I have seen two patients at the Clinique (and all observers record similar facts), who had this fever, the one on the fifth and the other on the sixth day; and since that time I have often had occasion to make the same remark.

[For the sake of greater precision, we think it best to quote M. Béhier's observations on the subject. "I investigated," says this professor, "the cases of 974 women, in order to determine the precise period at which the flow of milk takes place. In 22 it occurred within the first day after delivery; in 170 on the second day; in 347 on the third day; in 266 on the fourth day; in 100 on the fifth day; in 22 on the sixth day; in 5 on the seventh day; in 4 on the eighth day; and in 1 not until the eleventh day."]

Where the child's death takes place at an advanced stage of gestation, and the dead body is not expelled for several days afterwards, it is by no means uncommon to find all the phenomena of milk fever manifesting themselves.

In ordinary cases, by the time the fever is over, the breasts have acquired their highest degree of distention, and the secretion of milk is very abundant. If the child draws well, they are emptied and the patient relieved; but should the mother not suckle her infant, the engorgement continues for a longer period, though it wears away the more promptly as it was less considerable in the first place, or as the milk flows more easily from the nipple, and as the perspiration and lochia are the more abundant.

The question as to the cause of milk fever has been discussed again and again; but without entering into all the arguments which this point of doctrine has given rise to, we will merely remark, that the febrile movement (which, however, is not always constant) most probably is a consequence of the greater activity the mammæ then assume, and that it is nothing more than what takes place whenever any organ undergoes a very considerable and rapid development.

To women who do not nurse, the lacteal secretion may be the cause of accidents which are to be prevented or opposed. Everything that could tend to increase the secretion of milk, such as succulent food, and the practice of drinking freely, should be strictly avoided. Warm and soft towels should be applied to the breasts, and renewed as soon as they become moist. A still better application is cotton wadding. By these means perspiration is excited, and the heat of the parts maintained. Should the secretion diminish gradually, everything may be left to nature, but should the breasts become too much swollen, the discharge from the nipple should be facilitated by the use of emollient cataplasms, or efforts be made to empty them by suction. In case of these measures proving ineffectual, recourse must be had to lotions containing laudanum for the purpose of relieving pain, and to sudorifics and purgatives as revulsives. As amongst the most commonly employed diaphoretics, we may mention weak tea, and the infusions of Parietaria and Borage. The purgatives are those which have been already mentioned. Of all the preparations which have been extolled as lactifuge, the *petit-lait* of Weiss[1] is, according to Desormeaux, the only one which is still employed. The same author states that he knew a lady to apply an ammoniacal liniment with success. Neuter asserts, as proved by experiment, that the application of cups to the back diminishes the flow of milk; and Van-Swieten knew a galactorrhœa to yield to a strong infusion of sage, taken in doses of from one to two ounces every three hours.

---

[1] The *petit-lait* (whey) of Weiss is prepared by infusing in boiling whey a species of galium, flowers of elder, hypericum, and of the linden-tree, together with senna and sulphate of soda. It acts as a purgative. — *Translator.*

[M. Blot was the first to discover the presence of sugar in the urine of lying-in women as a phenomenon connected with lactation. It would seem from his researches that sugar, whose presence in urine had been regarded as pathognomonic of diabetes, exists not only in the urine of all lying-in women but in all nurses, and in a certain proportion of pregnant females. The term *Physiological glycosuria* has been used to express this fact.

"In all puerperal women (45 in 50)," says M. Blot, "the sugar begins to appear in the urine in determinate quantity coincident with the beginning of the flow of milk; and in many cases it does not exist until then. In a few cases it may be found previously, but generally in very small amount. If the secretion of milk continues, sugar continues to be passed in the urine with diurnal variations as yet unexplained. When the flow of milk is profuse, the proportion of sugar is usually large; if the former be moderate, the latter is small. In this way an examination of the urine may enable us to judge up to a certain point of the value of a nurse. If the flow of milk be lessened or arrested from any cause, and especially by the development of a more or less serious morbid condition, the sugar diminishes in quantity or disappears entirely. If health be restored and the secretion re-established, the sugar reappears. Finally, the urine contains sugar as long as milk continues to be secreted: I have found it in considerable proportion (8 grammes to 1000 of urine) in one case in which the woman had been nursing for twenty-two months. In fact, the urine is generally rich in sugar in proportion as the health improves and approaches most nearly to the normal or physiological condition.

"When lactation ceases, the sugar disappears, and that at periods varying in different individuals; earlier in those who do not nurse, and later in those who, having nursed, begin to wean the child.

"Sugar was found in one-half the observed cases of pregnancy. I think, without being able to affirm it positively, that this peculiarity is most likely to be observed when the breasts sympathize most with the pregnant condition; that on the contrary, it is absent when the breasts remain indifferent, as it were, to what is going on in the uterus." (Blot.)

This physiological glycosuria is also present in the different species of mammalia.

As a test of the presence of sugar in the urine, M. Blot used successively Fehling's fluid, caustic potash, fermentation, and the polarimeter.

Physiological glycosuria seemed then to be an established fact, when M. Leconte appeared with an absolute denial of the presence of sugar in the urine of nursing women, and asserting that the whole was a mistake due to the presence of uric acid, which gives reactions similar to those produced by sugar.

In this scientific dispute M. Bruecke espoused the cause of M. Blot, and, I would add, that a personal repetition of the experiments convinces me of the existence of physiological glycosuria. Further observations are, however, required in order to clear the subject of all doubt.]

CHAPTER X.

OF THE NECESSARY ATTENTIONS TO THE LYING-IN WOMAN.

THE patient should be placed in a large, well-aired chamber, which is moderately warm, and free from all strong odors. In summer, the doors and windows are to be opened every day; though, while the air of the apartment is being changed, she ought to be carefully covered, and have the curtains drawn, so as to protect her from any draft; but, at other times, the curtains need not be closed. The room ought to be kept scrupulously neat, and the urine, excrements, and soiled linen should be removed at once. The genital parts must be often bathed with lukewarm water, or some emollient decoction. These frequent ablutions have the further advantage of calming any inflammation in the parts that have been contused during the labor; they should be made morning and evening, and without uncovering the patient.

[As the newly delivered female is liable to various accidents, and diseases which make rapid progress, she ought to be visited every day.

In the first place, the physician should inquire into the general condition and determine the acceleration or lessened frequency of the pulse, which will rarely deceive as regards the prognosis. (See page 422.) He will also ascertain carefully the condition of the uterus as to size (see page 423) and sensibility, the character of the lochia, and the severity of the after-pains. The turgescence of the breasts and their secretion will also demand his attention; and, finally, he will inquire into the state of the bladder and rectum.]

The secretion and excretion of urine generally present nothing abnormal, though there is sometimes difficulty in the emission, due to swelling of the meatus. Occasionally, also, the bladder suffers temporary paralysis from severe pressure in tedious labors. In such cases the catheter should be used. The physician ought always, during the first two or three days, to inquire whether the water passes freely and with ease, because its collection in a half-paralyzed and benumbed bladder may often explain a state of uneasiness or suffering not otherwise to be accounted for.

[Retention of urine sometimes occurs with lying-in women immediately after delivery, and sometimes not until after several days. In the former case, it would seem due to paralysis of the bladder or contusion of its neck; in the latter, it is probably caused by consecutive inflammation. At other times the patients do not empty the bladder, and it remains considerably distended without their knowing it. Therefore, after questioning the patient on this subject, the accoucheur ought himself to ascertain whether the bladder is emptied. It is very important not to overlook a distended bladder, though it is often done, for then the physician necessarily falls into an error of diagnosis in regard to the cause of the suffering in the lower part of the abdomen.

The symptoms of retention of urine in lying-in women have some peculiarities. The bladder, being pressed forward by the uterus, which forms a resisting plane behind it, almost always projects sufficiently above the pubis to form a tumor there which is appreciable to the eye. The tumor is rounded, soft and supple to the touch, fluctuating, and dull on percussion. All these characters have but a secondary value, so that whenever retention of urine is suspected, the uterus should first be sought for, and will be known by its size and especially by its hardness: if the uterus cannot be felt, it is because it is concealed by the distended bladder. Repletion of the bladder has, also, upon the position of the womb an effect which should be well understood: when the distended organ rises into the lower part of the abdomen, it carries with it the uterus, whose fundus is then found as high as, and often even above, the umbilicus, and when the catheter is used, it descends as the water flows. Whenever, therefore, the fundus of the uterus is found too high up, the sub-pubic region should be examined carefully to ascertain whether the bladder projects there. If the latter be empty, the fingers will, without difficulty, feel the anterior surface of the womb throughout.

Retention of urine sometimes continues in these cases for several days, and even for several weeks. So long as it lasts, the catheter should be used at least twice a day according to the rules already pointed out (see page 61). The bladder almost always recovers its power after a certain time, so that there is no occasion for alarm should the retention last for several days.]

The constipation that is so common during the last stages of gestation, oftentimes still persists after the delivery for four, six, or even eight days, and this prolonged retention of the fecal matters may give rise to anxiety, headache, loss of sleep, and sometimes even to a feeling of weight, or actual pain in one of the iliac fossæ; all which symptoms disappear like magic upon the administration of some mild laxative. Where the costiveness continues, a state of suffering very frequently results, which may occasion slight febrile movement; and the frequency of pulse, thus produced, coinciding with the pain caused by an unusual retention of the fecal matters, which pain is most commonly located in some part of the hypogastric region, and is augmented by pressure, may give rise to suspicions of a peritoneal inflammation that really does not exist; and I have known this error to be committed where the pain and fever that had resisted the application of leeches, rapidly disappeared after the exhibition of a purgative. The retention of the fæces may also result from a paralysis of the rectum, which paralysis itself is a consequence of the pressure made upon it by the head during its prolonged sojourn in the excavation. I have known, says M. Martin, of Lyons, the fæces to be retained more than twenty days after a laborious delivery, and to accumulate in such large quantities, and acquire such a firm consistence as to equal the size of a child's head at term; and as all the usual laxatives failed, I was obliged to introduce a scoop, and bring the hardened matters away piecemeal; but even then the gut did not at once regain its functions, though a fresh accumulation was prevented by the use of irritant injections, and the contractility of the intestine was not perfectly re-established until twenty-nine days afterwards, at which period the patient left the hospital. (*Comptes Rendus*, p. 32.)

A temporary constipation, prior to the invasion of the milk-fever, is a matter of no consequence; but should it persist for several days afterwards, injections may be administered, either simple, or else rendered slightly laxative by the addition of an ounce or an ounce and a half of the *miel mercuriale*, or a decoction of senna leaves; and where these measures do not answer, a mild purgative, such as the following, is exhibited by the mouth, viz., from half an ounce to an ounce of castor oil, rubbed up with an ounce of almond emulsion and a little lemon syrup; or the *sal de duobus* (sulphate of potash) might be employed, in the dose of fifteen or thirty grains, dissolved in her usual drinks. The castor-oil can be swallowed without much difficulty when it is diffused in a cup of rich broth, made as hot as the patient can bear it. I have observed that it is much oftener retained when mixed with broth than when mixed with almond emulsion.

The woman should make no exertion during the first few days, and if the labor has been long and painful, or attended with any serious accident, it is best that she should be protected from violent and rude motions, and that the bed be not made up until after the milk fever has subsided. When, however, the patients are but slightly fatigued, the bed may be made on the evening of the day preceding that on which the milk fever supervenes, after which it should be left until the next day but one; thereafter it may be made every day. The woman should, on these occasions, be transferred to another couch.

It is very important that the patient should not rise before the ninth day, which is a favorite time for getting up with the working classes, and where she is in easy circumstances, and can, without detriment to her interests, abstain for a longer period from her household duties, she should be required to remain in bed for at least two weeks. It were better not to adopt arbitrarily any particular day, but to regulate the conduct to be followed by the degree of atrophy of the uterus. When the latter has lost the greater part of its bulk, and its fundus descends and disappears in the lesser pelvis, the patient may get up. One woman may do so without danger on the eighth day, whilst another ought to remain in bed after the fifteenth day. At this period she may be carried to an easy-chair, where she will remain seated for an hour or two, and again, on the following day, for two or three hours. On the third, she might try her strength by taking a few turns around the chamber, and then through the apartments; but it would be imprudent to venture out of doors, especially in the winter season, before the fifteenth or twentieth day, and only then in fine weather and about the middle of the day.

Most women, actuated by a religious feeling, go to church on the occasion of their first going out; and as these buildings are always cold and damp, they often return with the germs of an inflammatory disease, which sooner or later develops itself; and hence the physician should advise the deferring of this religious ceremony, called the *churching*, to a more distant period.

As regards her diet, the articles ought to be of the mildest character, and of easy digestion; thus, as a general rule, she will only need, during the first day or two, a little porridge two or three times in the course of the day, and some broth during the night; and she should observe an absolute diet pending the duration of the milk fever, for fear of adding to its intensity; though even here, if the general reaction is moderate, she might be allowed some broth. After the fever is over, the quantity of nourishment is gradually augmented; so that, by the twelfth or the fifteenth day, the woman has resumed her ordinary habits. In those who do not nurse, the regimen must be more restricted, especially when the breasts still remain engorged or painful.

[The regimen of lying-in women, as just indicated, was rigorously observed until within a few years; but, we ought to add, there is now a strong dispositi differently. Legroux, physician at the Hotel Dieu, introduced the innovation by showing that not only was there no danger, but often a real advantage in giving nourishment freely to newly delivered patients. Accordingly, he allows soups to the women in his wards on the first day, and solid food on the second day after delivery. I have followed his example for several years, and have had no reason to be other than pleased with it. Immediately after delivery, therefore, I allow soup, taken in small quantities, but freely. On the next day solid food is permitted; an egg or mutton chop, for example, with bread and claret and water. After the secretion of milk has begun, the patients can resume their usual diet. This plan has but the single inconvenience of eliciting the disapproval of those who have grown up in other ways of doing; but inasmuch as it is better for the patients, we shall have to disregard these objections.]

Throughout the whole lying-in period, the patient should use some diluted ptisan, moderately sweetened and rendered aromatic, as an ordinary drink; such as a solution of gum, or an infusion of mallows, of violets or linden, the orange or chamomile flowers, &c., &c.; but acidulated drinks must never be allowed to those who nurse. About the seventh or eighth day, most patients ask their medical attendant for something to *drive away the milk*, which, of course, is generally a useless precaution; but, perhaps, it would be better to yield to a very popular prejudice, so as to escape all subsequent reproach. The Canne de Provence, and the infusion of periwinkle, &c., enjoy a high reputation for this purpose; and as the root of the former is nearly inert, it will, on that account, be preferably employed.

Most women think it necessary to be purged towards the end of their lying-in; and though, when the physician discovers any positive counter-indication to the administration of even a mild purgative, he doubtless should not yield to their desires; yet, under ordinary circumstances, he ought to purge them slightly, both on account of his own reputation and to avoid subsequent unjust reproaches; indeed, this will become necessary, if the tongue is broad, furred, and yellowish or greenish, the mouth bitter and clammy, and there is a loss of appetite. The Seidlitz waters and castor-oil are perhaps preferable, from their mildness and certainty of operation.

The excitability of the nervous system is such, in lying-in women, that the greatest care should be exercised in keeping away everything that might excite them, and in avoiding all acute moral emotions.

PART IV.

PATHOLOGY OF PREGNANCY.

THE pathology of pregnancy comprises all functional derangements occurring in pregnant women, as well as all spontaneous or accidental lesions of the ovum which may compromise the health or life of the fœtus. As the latter class usually either escape detection, or are not discovered until it is too late to remedy them, they will be considered briefly; all, in fact, that can be said of them is limited to certain questions of pathological anatomy, foreign to the main object of this work.

[Some of the numerous diseases observed during pregnancy are the result of this condition; others occur, as it were, by chance, and often happen under other circumstances. On this account, they are treated of in separate chapters; a division, however, which is far from perfect, as the distinction between the two classes cannot always be defined. The first chapter is devoted to the diseases which may occur during pregnancy, and the second to those which are the result of it. Afterward are described extra-uterine pregnancies, lesions of the ovum and of the placenta, and diseases of the fœtus and its death. The last chapter treats of abortion.]

CHAPTER I.

OF THE DISEASES WHICH MAY EXIST DURING PREGNANCY, AND OF THE RECIPROCAL INFLUENCE WHICH THEY MAY HAVE UPON THEIR PROGRESS AND TERMINATION.

THOUGH, says Antoine Petit, pregnancy exposes women to various disorders, it also protects them from many very dangerous diseases, arrests the progress of others, and sometimes even cures those with which they were previously affected. This proposition, though asserted almost as a maxim by the author quoted, is, unfortunately, far from being strictly true. Antoine Petit was indeed strangely deceived in his appreciation of the influence of pregnancy upon acute diseases existing before it or occurring during its progress; still, as many physicians partake of his error, we have thought it right to notice it at the outset.

§ 1. EPIDEMIC DISEASES.

1. *Influenza.*—Though some epidemics have appeared to spare pregnant women, many have affected them as severely, at least, as other individuals exposed to the same influences. Thus I found, as did also M. Jacquemier,

at the Maternity Hospital, that the epidemic of influenza attacked a great many pregnant women; but, contrary to his observation, I witnessed numerous abortions as a consequence either of the disease itself, or of the violent spells of coughing which tormented the patients.

2. *Cholera.*—The severe epidemics of cholera which, in 1832 and 1849, were so fatal in the capital, did not spare pregnant women; and we had the pain of witnessing the death of quite a number.

Dr. Bouchut has endeavored, in a quite recent work, to appreciate the effect of pregnancy upon cholera, and *vice versa.* Relying upon 52 observations, he commences by showing that pregnancy has no influence upon the invasion of cholera, that it protects from it no more than it predisposes to it, and that when the disease appears, it does so without any modification, in all its forms and severity.

Cholera has, however, an incontestable influence upon the course of gestation, often shortening its duration. Thus, 25 women out of 52 aborted in consequence of the disease, and the same would probably have been the case with others, had not the patients been removed by an early death. Except in some rare instances, abortion took place only in cases in which the disease lasted over twenty-four hours.

Of the 25 women who aborted, 16 recovered; 12 had the disease with moderate severity, though lasting for a considerable time; the attack in 4 was dangerous and rapid, and 9 died.

The observations of M. Bouchut have elicited the remarkable fact that abortion is very common in cholera patients after the fifth month of pregnancy, but very rare at its commencement. Thus, of the 16 women who aborted and recovered, only 1 was three months pregnant, 1 four, 6 five, and 1 six; and the least advanced of the 9 who died after abortion, had reached four months and a half.

Of the 27 women who did not miscarry, only six recovered and had their pregnancies to continue. The attacks which they suffered were of medium severity, and of several days' duration: 21 died with the disease in a dangerous and rapid form.

Altogether there were 30 deaths out of 52 cases. We see, therefore, that the prognosis of cholera is not rendered more favorable by the state of pregnancy.

We have said that 6 of the patients recovered, and had their pregnancies to pursue their regular course. Others, who had reached a more advanced stage, were delivered prematurely of living children. From this, it plainly results that cholera is not always communicated to the fœtus, and that though the latter usually succumbs either before its expulsion, or before the mother, in those cases where her early decease did not allow the abortion to take place, its death cannot be attributed to a transmission of the disease. Besides, the autopsy of the children revealed nothing which could be regarded as pertaining to cholera.

What, then, is the cause of the death of the fœtus, preceding, as it almost always does, its own expulsion, or the death of the mother?

M. Bouchut thinks that it is a consequence either of a mechanical compression of the uterus produced by the cramps and convulsions of the abdominal muscles, or to the severe diet to which the patients are subjected; again, he supposes that it may be occasioned by the profuse discharges from the bowels, which, by depriving the blood of its serum, dry up, as it were, the sources of nutrition. For my own part, I regard asphyxia as the only, or at least the usual, cause of the death of the fœtus. The coagulation of the blood, and its stagnation in the vessels, are evidently calculated to suspend the utero-placental circulation; and the interruption of the latter, depriving the fœtus as it does of the means of respiration, must necessarily lead to its rapid death.

M. Devilliers, Jr., read before the Academy of Medicine an observation tending to prove that abortion has a favorable effect upon the termination of cholera, and causing him to feel justified in recommending the provocation of premature labor, as a means of diminishing the danger of the disease. In examining under this point of view the results furnished by M. Bouchut, a result favorable to the opinion of M. Devilliers is at once discoverable; since of the 27 patients who did not miscarry, 21 died, whilst 9 deaths only occurred after 25 abortions. Still, it should be observed, that of the women who recovered after aborting, 4 only had the disease in a rapid and dangerous form; whilst of the 21 who died undelivered, the disease was very severe, and barely lasted a few days. This early fatal termination was, very probably, the only cause which prevented abortion.

The view of M. Devilliers cannot, therefore, be received without new confirmatory observations.

In short, though pregnancy does not affect sensibly the progress and danger of cholera, the latter leads, in the great majority of cases, to the death or premature expulsion of the fœtus.

§ 2. ENDEMIC DISEASES.

Intermittent Fever.—There can be no doubt that, as M. Ebrard has endeavored to prove, the grave disorders and deep perturbations produced throughout the economy by the febrile paroxysms, the obstinate vomitings which attended many of them, and the cough, diarrhœa, and colics, may disturb greatly the functions of the womb; also that the fluxion and congestion so often produced by this fever, may cause the premature expulsion of the product of conception.

The possibility of the occurrence being incontestable, the indication to remove the morbid condition follows as a matter of course. I mention this influence of intermittent fever upon the pregnant condition only as affording an opportunity of discarding completely the advice of some persons who recommend the rejection of sulphate of quinine, as likely to produce abortion or premature labor. The miscarriages laid to the charge of the sulphate of quinine should certainly be attributed to the disease itself, and not to the remedy. For my own part, I have had occasion to use it six times at various periods of pregnancy, in doses of ten, twelve, and even fifteen grains in the twenty-four hours, without having had to repent of it. Many practitioners, who, like MM. Thezet, Delmaz, Alamo, and Ebrard, have long practised in localities where this fever is endemic, have never been obliged to complain of the action of sulphate of quinine when administered during pregnancy. Not only is it an innocent remedy, but the surest preventive means when abortion is imminent in consequence of the fever.

[Some facts go to prove that pregnant women attacked with intermittent fever may communicate the disease to the fœtus. Dr. Stokes, of Dublin, states, that he saw a case of tertian ague during pregnancy in which the fœtus was affected with convulsive movements remarkable for their correspondence with the apyretic days of the mother.

M. Pitre-Aubanais relates two cases of intermittent fever communicated to the fœtus by the mother. Both of these children were born with hypertrophied spleens, and their attacks of fever coincided both as to day and hour with those of the mother. (Bourgeois de Turcoing.)

M. Jacquemier also says, that it would seem that intermittent fever may attack both mother and fœtus at the same time, and the facts upon which he bases his assertion, though few, appear conclusive. Schurig relates that a woman had a rebellious quartan ague in the second month of her third pregnancy, and that in the last month either before or after the paroxysms she felt the child to be excited, shiver, and roll perceptibly from one side to the other. At last, after a severe paroxysm, she was delivered of a girl which had a violent attack of fever at the same hour with the mother, and which continued to return during seven weeks. Similar cases were observed by Hoffman and Russell. (Jacquemier, *Traité d'Obstetrique.*)]

§ 3. ERUPTIVE FEVERS.

1. *Variola.*—The *eruptive fevers* seem, generally, to be much more dangerous to pregnant women than to other individuals. Variola, especially, of all these diseases, has the most disastrous influence upon the pregnant condition; some authors, indeed, state that it is almost uniformly fatal, particularly when it produces abortion.

It is important, as regards the prognosis, to distinguish between the confluent and discrete forms of small-pox. (Chaigneau.) The former, which is so fatal, independent of pregnancy, as to destroy a third of whom it attacks, is still more to be dreaded during gestation, sparing, as it does, almost none of its victims; the latter, on the contrary, is far from always occasioning abortion or premature labor, and even where the pregnancy is ended before term, the mother often recovers.

Dr. Gariel thinks that the lumbar pains, which are so severe in the first stage of variola, have a great tendency to produce abortion. I have seen in two cases of the discrete form, slight contractions coinciding with these lumbar pains; but I was able to arrest them by the use of opiate injections. In several other instances, I witnessed nothing of the kind, and I think with M. Chaigneau (Thesis, 1847), that abortion is specially liable to occur when the pustules are in full suppuration, and the secondary fever appears, in connection with the grave symptoms which usually accompany it.

To recapitulate: confluent small-pox nearly always occasions abortion, and this is almost uniformly followed by the death of the mother: out of 23 abortions observed by M. Serres under these circumstances, there were 22 deaths. Discrete small-pox, on the contrary, generally allows the pregnancy to continue its course, and even when it interrupts its progress, the mother usually recovers, and in the latter months the child is expelled alive.

When the fœtus is not expelled, it may continue to grow, and often it does not appear at birth to have suffered much from the disease which had endangered its mother's life so greatly; in other cases, however, either because it receives the germ of the disease which affects the mother, or because the deep-seated disorders which the variola produces in the maternal system also exert an unfavorable influence upon the fœtal life, it soon perishes. In the former case, variolous pustules, in every respect similar to those on the mother, may be detected on the body of the child.

[We have just stated that the unborn child of a mother affected with variola may contract the same disease, a fact attested by various authors. In this case, the mother communicates a contagious disease with which she is herself suffering; but it would be wrong to suppose that every pregnant woman having variola must necessarily transmit it to her child. M. Serres knew of twenty-two non-variolous children born of women who had the disease during pregnancy. Mead even holds that if the woman does not abort, her child is exempt from variola for the rest of its life, provided it be not born before the maturity of the eruption. The fact is curious, but denied by Contugno, whose opinion may find support in the following facts: Two pregnant women were inoculated; the eruption was discrete, and gestation progressed. At the usual period they were delivered of healthy children, which, at three years of age, were inoculated and had the regular disease.

On the other hand, it seems that the fœtus only may have variola before birth, even though the mother may never have had it. Though the fact may appear extraordinary, it cannot be questioned in opposition to the testimony of such credible authors as Ebel, Kesler, Watron, Jenner, Deneux, Royer, Bouchut, and Chaigneau, all of whom have seen children born with variola, the mothers being free from the disease. In several of these cases, the mothers having been vaccinated were insusceptible to the epidemic influence, yet were able to communicate the virus to the fœtus.

Congenital variola appears at all stages of pregnancy. Before the third month it is rare; and generally it is discrete, so that there may not be at the utmost more than a hundred pustules on the entire body, and often many less. It is observed that the pustules do not follow the same course of evolution as they do in the open air, but being always bathed in the amniotic fluid present the same phenomena as those which affect the mucous membranes. They are whitish and flattened, but larger than such as are found in the cavity of the mouth. A few become resolved, but others ulcerate quickly when the slight pseudo-membranous disk covering them falls off. The wound suppurates little, never furnishes crusts on account of the moist state of the parts, and cicatrizes without leaving any mark. Occasionally, however, the characteristic scar is seen, but even then is very superficial.

When mother and fœtus have variola at the same time, the pustules appear at the same time in both. M. Chaigneau has, however, seen a few cases in which it was later in the children, not occurring until long after it had disappeared from the mother. The unborn child affected with variola is almost sure to die. (*Bourgeois de Tourcoing.*)]

2. *Scarlatina*, when of some severity, acts in nearly the same way as variola; the danger, however, is usually far less both to mother and child. It sometimes gives rise to abortion, and then the patients very often succumb. My opinion coincides with that of M. Serres, who thinks that women are much more likely to contract the disease when recently delivered than they are during pregnancy, for I have never seen scarlatina during gestation, though I have had the misfortune to lose two newly-delivered females from the disease.

3. *Measles*, according to Levret, is quite as grave as the preceding. *In* four cases, however, observed by M. Grisolle, the regular course of gestation was undisturbed, and two similar instances have come under my own notice.

[Unfortunately, however, this is not always the case, for M. Bourgeois de Tourcoing, from whose excellent memoir we have made several extracts whilst preparing this chapter, has himself met with fifteen cases of rubeola in pregnant women, eight of whom either aborted or were delivered prematurely. In the remainder the pregnancy was not interfered with. In the former the disease was most severe in the most advanced cases, and the first symptoms of abortion or delivery appeared toward the end of the disease.

Very rarely have children been born affected with rubeola; Rosen and Vogel relate some cases; Guersant met with one, and Bourgeois mentions another, in which the child lived but three days.

§ 4. Various Sporadic Diseases.

1. *Typhoid Fever.*—Typhoid fever may occur at any stage of pregnancy. It often causes abortion, which may take place in the first or second week of the disease.

According to Bourgeois, of twenty-two cases attacked early in pregnancy, six who had the disease lightly did not abort, whilst out of sixteen grave cases twelve aborted. Of fifteen cases of fever occurring during and after the seventh month, the same observer notes nine cases of premature delivery. Of these, five occurred during the first week of the disease; five of the children were still-born, one lived two days, and one survived.

The remaining women were delivered during the second week of the fever; two of the children died during labor; one lived two days and a half, and one only was raised, being an eight-month's child. The two surviving children presented nothing peculiar.]

Though I have rarely had occasion to observe typhoid fever during pregnancy, I have frequently seen it occur during the lying-in. Its commencement is usually insidious, the first symptoms having always been those of a puerperal inflammation, and presenting all the characters of the typhoid disease only after the lapse of the first few days, and the disappearance of the abdominal symptoms. What is very singular, if I may judge by the cases which I have observed, the typhoid fever, so far from being influenced unfavorably by the puerperal state, is even less grave than in the ordinary conditions of life. Not one case of 17, of typhoid fever supervening a few days after delivery, proved fatal. The same remark is made by M. Fauvel, who did not witness a single death in the cases of the lying-in women who had the disease. Although the cases are too few to warrant a definite conclusion from them, they seemed to me of sufficient interest to be recorded.

2. *Pneumonia* is, without doubt, of all the acute inflammations of the envelopes or of the parenchyma of the organs, one of the most likely to produce abortion or premature labor. M. Grisolle has himself observed 4 cases of pneumonia in pregnancy, and collected the details of 11 others. Of these 15 women, 10 had not reached the sixth month, and 4 aborted the fourth, fifth, sixth, and ninth days from the commencement of the attack. In 3 cases, the abortion was followed by disease of the lungs of the severest character, all proving fatal three or four days after; only one, whose pneumonia was limited, recovered without serious symptoms. .The 6 who did not miscarry, died without exception during the progress of the disease.

Of the 5 women who had reached an advanced stage, 2 were seven months pregnant when attacked with pneumonia; one was delivered prematurely on the twelfth, and the other on the fifteenth day, both dying two days after. The 3 others were in their ninth month: 2 were delivered of living children on the seventh and eighth day of the disease; the other died undelivered on the fifth day.

From the preceding data it may be concluded, that abortion usually follows an attack of pneumonia during pregnancy. I think, says M. Grisolle, that its disastrous influence is explained by the importance of the organ affected, by the gravity of the disease, the intensity of the general reaction, and the numerous sympathetic disorders which it produces in all the functions, much rather than by the paroxysms of coughing.

That the pregnant condition exerts a most dangerous influence upon the disease is shown by the fact, that of 15 women 11 died, though the general state of health was apparently very favorable in most of them. The prognosis seems to be more discouraging before than after the seventh month. Finally, if it be allowable to conclude from so limited a number of facts, abortion, contrary to what we have seen in regard to variola, would appear to be rather favorable than otherwise, since of the 4 cases of miscarriage one recovered, whilst the 6 who did not abort, all died. This would seem to confirm the following proposition of Desormeaux, namely: Abortion, which occurs but too often in acute diseases, frequently leads to a favorable termination in inflammatory affections.

3. *Various Inflammatory Diseases.*—We have but very imperfect data by which to judge of the reciprocal influence of pregnancy and of other acute inflammations. The statements of authors in regard to it are limited to a few isolated and often contradictocy facts, whose very restricted number allows no useful conclusion to be drawn from them.

Whatever be the acute affection from which the pregnant female suffers, the treatment does not differ materially from that which is proper under ordinary circumstances. So long as there remains a reasonable hope of saving the mother by the use of mild and innocent remedies, none other should be resorted to; but if the disease be dangerous, and demands more active but more efficient means, it should be treated as though the woman were not pregnant. Bleeding and purgation which have been reproached with a tendency to produce abortion, may doubtless have that effect; but it must not be forgotten that they are used here to combat an affection which s, of itself, a much more active cause of abortion, besides endangering the mother's life so seriously.

4. *Icterus.*—Though icterus appears to affect the pregnant condition unavorably, it is not exactly true to say that it always arrests its progress and produces abortion, either as regards the severest or the lightest cases of the ffection. I have seen several cases of simple jaundice which constituted but a slight indisposition, and in no degree affected the gestation. The conrary has, however, been the case in some instances, and the two following, quoted by M. Ozanam, seem to me to be evidently exceptional:

A young primiparous woman, five months gone, had been sick for five days with a very simple jaundice, when she entered the hospital; three days after, she miscarried. Another, seven months and a half pregnant, also aborted five days after the commencement of a simple icterus. Neither of the children presented a yellow hue. Both mothers recovered.

The life of the child is greatly endangered by its premature expulsion, though it is rarely affected with the mother's disease. In none of the cases which have come under my notice did the fœtus present an icteric hue, although the amniotic fluid was more or less colored. J. P. Frank, however, relates the case of an icteric female who was delivered of a jaundiced child.

It is rarely that what is described as the grave form of essential icterus does not determine abortion, and it is also rare for the latter not to be followed by the death of the mother. Thus, out of the five cases reported by Dr. Kerksig, in the account of the epidemic which occurred in 1794, there were four deaths. M. Ozanam relates the case of a woman six months pregnant who died before miscarrying; and my friend, Dr. Fournier, has quite recently had a case of abortion followed by death.

[Churchill quotes the following account by Dr. Saint-Vel of an epidemic of jaundice in the island of Martinique in 1858.

"This icterus, which presented all the characters of an essential disease, surprised the medical men by its epidemic character, and its gravity in pregnant women, and in them only. It began at Saint-Pierre about the middle of April, reached its height in June and July, and having gone through the colony, ended with some isolated cases toward the close of the year.

"Attacking the various races of which the population consists, the white as well as the negro and the Indian coolie, the European as well as the Creole, it seemed to prefer adults, and was unattended with affection of the liver. When pregnancy did not exist, its termination was almost invariably favorable. The only victims were women, amongst whom were three young females not pregnant, and a woman of sixty-three years of age. In these it was always of a grave character, always the same, always mortal, and always accompanied by coma.

"Of thirty pregnant women attacked at Saint-Pierre, only ten reached term with no other symptoms than those of essential icterus. The remaining twenty died comatose after abortion or premature delivery.

"In the gravest cases in pregnant women the disease always pursued the same course. It always had the essential form, and was often light, until the occurrence of abortion or premature delivery, which never took place before the jaundice appeared. They were generally brought about by the latter after it had existed for two, or, less frequently, three weeks. Until coma appeared, the symptoms had no apparent gravity, nor presented anything peculiar. The coma preceded or followed the abortion or labor by a few hours, in two cases only coming on three days after.

"The women who died had reached the fourth, fifth, sixth, seventh, and eighth months of gestation. The coma was, in rare cases, preceded by a slight delirium, it never for a moment disappeared, but grew more and more profound until death occurred. It lasted but for a few hours, though in two cases it continued for twenty-four and thirty-six hours. Until it came on there was nothing special to be observed in regard to the general sensibility, respiration, or circulation. The pulse was not quickened, nor had it that slowness which is sometimes observed in cases of jaundice. None of the other features of grave attacks of icterus, not even uterine hemorrhage, were observed. With perhaps one exception, the women who died had no hemorrhage after delivery, and when death occurred three or four days subsequently, the lochia were of a normal character.

"Almost all the children were still-born, a few only living for a few hours, whilst but one survived and is still living. None of them were jaundiced, nor had any of the ten other children born at term of jaundiced mothers any sign of the disease." (Saint-Vel, *Gazette des Hopitaux*, Nov. 20th, 1862.)

On the other hand, Dr. Bardinet read in 1863 an account of a grave epidemic of icterus which prevailed in Limoges from the month of October, 1859, to March, 1860. In 13 women observed by him the pregnancy followed its regular course in five cases which were delivered safely at the ninth month. In 5 others the disease was followed either by abortion or premature labor. In the remaining 3 the icterus assumed a grave form with ataxic symptoms followed by coma, and both mothers and children soon perished.

Both multiparæ and primiparæ were attacked by the disease, but all had passed the fifth month of gestation.[1]

Dr. Bardinet recapitulates as follows:

1. Icterus may appear as an epidemic amongst pregnant women.

2. It then assumes three different forms, viz.:

a. In the first it is simple or benign in character, and allows the pregnancy to progress favorably to term.

b. In the second it assumes the first degree of malignity, forming what might be called *abortive jaundice*, and occasioning either abortion or premature delivery without other unfavorable consequences.

c. In the third it assumes all the characters of the grave form of icterus, producing ataxic symptoms and coma, which soon terminate the lives of both mother and child.

H. Blot, in the excellent report from which I have quoted the preceding facts, relates a severe case of icterus observed by him at the Hospital of the Clinique. The patient died, and at the autopsy ecchymoses were found beneath the skin, and on the surface of the brain, of the heart, of the lungs, and of the intestinal canal. The liver was small, and of a deep-brown color, without yellowish spots. Microscopic examination showed that the tissue of the latter organ was destitute of a single trace of an hepatic cell. All the preparations showed merely fat globules in abundance mixed with biliary matter.

The cause of grave icterus during pregnancy remains unknown. I am disposed, however, to believe with M. Blot that it is due to changes in the liver, which I described long ago as occurring in pregnant women. (See p. 157.)

In regard to treatment, we are obliged to admit the inefficiency of all measures employed up to the present time. Premature labor or abortion would probably be more injurious than useful. As to prophylaxis, we should not hesitate in case of the occurrence of epidemic jaundice, to advise pregnant women to change their place of residence.]

5. *Syphilis.*—Syphilis may have the most disastrous effect upon the course of gestation, being a very frequent cause of abortion, and especially of premature labor. Its mode of action is various: sometimes, for example, the mother is in such a cachectic condition as to be unable to provide the fœtus with the material required for its development, her enfeebled constitution leaving the work incomplete; most generally, however, the health of the mother is not sensibly altered, and the action of the poison seems to be directed upon the fœtus only. In most cases, indeed, the disease does not disturb the natural course of gestation, but attacks gravely the health of the fœtus. Nothing is more common than for the latter to perish at more or less advanced periods, and be expelled prematurely. In these instances, numerous visceral lesions are discovered at the autopsy: sometimes it is an

---

[1] H. Blot, *Bulletin de l'Académie de Médecine*, October, 1864.

abscess of the thymus gland (P. Dubois); sometimes purulent collections in the lungs (Depaul); sometimes, again, is found that singular alteration of the liver so well described of late by M. Gubler, or those traces of peritoneal inflammation and sero-purulent effusions pointed out by Dr. Simpson as due to the same cause. Neither is it rare to find numerous bullæ of pemphigus upon various parts of the body of the child, especially upon the soles of the feet and the palms of the hands. For further details, see *Diseases of the Fœtus.*

Cases such as we have just mentioned are, unfortunately, but too common; it is not, however, to be understood that every child born of infected parents must necessarily suffer all the consequences. We even insist that such is not the most frequent result, for considering the large number of parents who are diseased, or who have been, the syphilitic lesions of new-born children would be much more frequent than is really the case.

M. Legendre, in discussing the question of the latent condition of syphilis in the parents, and of its influence upon the health of the child, arrives at a denial of this influence in the majority of cases.

Of the 63 patients who came under my observation, he says, there were 14, who had altogether 68 children, during the period intervening between the disappearance of the primary symptoms and the development of the venereal eruption. Of this number, 35 died without ever having had an eruption upon the body. The mean of the ages of these children at death was 7 years; the extremes being 6 months and 22 years.

All the 33 surviving children enjoyed good health, the mean of their ages being 17 years; the extremes 1 year and 38 years.

[Inasmuch as it is said that syphilis may be transmitted by either parent, it is far more probable that it should be when both are diseased. We will examine successively the first two conditions.

A. *Transmission by the father.*—The father only being syphilitic, can he communicate his disease to the child? The question is, at present, much disputed, for although the affirmative is maintained by Trousseau, Diday, Depaul, and Bourgeois, a directly opposite opinion is arrived at by Cullerier, who bases his view upon the observation of healthy children whose fathers were syphilitic, but whose mothers were not. He believes that inherited syphilis is always derived from the mother, the father having nothing to do with it. The same doctrine is taught in the memoirs of Notta and Charrier, and our colleague M. Follin (*Traité de Pathologie Externe*) has observed six cases favorable thereto.

It is not easy, therefore, to decide the question. For our own part, we think that although the transmission of syphilis from the father to the child can hardly be denied in some cases at least, it is certainly less common than has been supposed.

B. *Transmission by the mother.*—This cannot be doubted. Two cases, however, present themselves: the mother may be syphilitic from the period of conception, or she may not have contracted the disease until after she became pregnant. In the first case there is no dispute as regards the fact of infection, but the unanimity ceases in the second case, when the question arises at what period of gestation the mother must be infected in order that it should be possible for her to transmit the disease to the fœtus. Cullerier thinks that it may occur at any time during pregnancy, whilst Ricord would restrict the possibility to the end of the sixth month, and Abernethy the seventh.

The opinion which would attribute to the use of mercury the effect due to the action of syphilis, is both false and dangerous. The observations of M. Dunal have shown that syphilitic women who had never been treated, or if so, in an imperfect manner, either aborted or were delivered prematurely of still-born or infected children which died: with those, however, who had the constitutional disease and were treated by mercury, the success was complete in many instances in respect both to mother and child.

6. *Saturnine intoxication.*—Women exposed to lead poisoning are very liable to abort. A former hospital interne, Dr. Constantine Paul (*Archives Générales de Médecine*, May, 1860), made a study of the effects of this action during gestation. He observed, in 1859, the case of a woman who had been three times safely delivered before being exposed to the influence of lead, and who afterward, out of ten pregnancies, had eight miscarriages, one child still-born, and but one delivered at term, but which died five months afterward. Struck by the observation, M. Paul thought that this great mortality might be due to the action of lead. The woman also informed him that almost all her companions in the establishment in which she worked either miscarried or were unable to raise their children. Then it was that he began his investigations.

M. Paul found 81 cases of women in whom saturnine intoxication occasioned either the death of the fœtus or the premature death of the child after birth; also miscarriages at from 3 to 6 months, and premature labors in which the children were born either dead or in a dying condition.

Out of a first series of observations, 4 women afforded a total of 15 pregnancies, in which there were 10 abortions, 2 premature labors, 1 still-born child, 1 which died within twenty-four hours, and 1 only which survived.

A second set of cases comprises the history of women who had been safely delivered before exposure to the influence of lead, but whose children afterward suffered from its effects.

Another set shows the alteration of results according as the woman gave up or resumed her occupation on several different occasions.

A final series proves that the fœtus may die of lead poisoning, even though the mother may have had no symptom of the intoxication.

To recapitulate. Out of 123 pregnancies there were 64 abortions, 4 premature labors, 5 still-born children, 20 which died within the first year, 8 in the second, 7 in the third, and 1 death at a later period, 14 living children, of whom 10 only were more than three years old.]

7. *Phthisis.*—Most authors, in writing upon this disease, have given currency to the idea, that its progress is arrested by the occurrence of pregnancy, but that immediately after delivery, the pulmonary affection advanced rapidly to a fatal termination.

In a work read lately before the Academy of Medicine, M. Grisolle has endeavored to determine the reciprocal influence of these two conditions, and in so doing has arrived at somewhat different conclusions from those which had been received as a general expression of the truth. We think it right to give a brief analysis of this memoir.

Of seventeen cases collected by M. Grisolle, and ten others furnished him by M. Louis, twenty-four were those of women attacked with the disease during pregnancy, at periods not far removed from its commencement; the three others had reference to individuals who presented the rational signs of tuberculosis at the time of conception, but in whom the disease became well-marked only at a later period.

In none of these cases was the pulmonary affection arrested, nor did it fail to progress quite rapidly. The symptoms peculiar to tuberculosis, whether local or general, were developed with the same order, the same regularity, and the same constancy as in the ordinary conditions of life. But, on the other hand, contrary to what might have been expected, the pregnant condition neither aggravated, nor rendered more frequent, the accidents of the disease; bronchial hemorrhage was noticed as being even rather less frequent than usual.

The entire duration of the phthisis in 13 women who were followed to the end was rather shortened than otherwise. Thus, in all of them it lasted on an average nine months and a half, which is a figure more than a third less than that which expresses its duration for women of the same age, but not pregnant.

Pregnancy has not, therefore, the power of suspending phthisis, which has been supposed. But is it true, as is generally believed, that labor, and the puerperal condition, give to the process of tuberculization such an unusual impulse as to make it prove fatal in a very short time? The facts appealed to by M. Grisolle invalidate this opinion also. Thus, 12 women, in whom the disease had reached the second, and in most of them the third degree, at the time of delivery, resisted its inroads for four months on an average; and in all, the symptoms followed the progression that is usually observed. In 10 others, in whom the affection was in the first degree, or at the beginning of the second, at the period of delivery, the pulmonary lesion was found in 3 to advance slowly; in two only did it exhibit a notable aggravation; whilst in 5, or one-half the number, there was a considerable amelioration both of the general health and local symptoms, without, however, encouraging the hope of a cure, or of a long suspension of the disease.

Does phthisis exert an unfavorable influence upon the progress of gestation? In this point of view, it may at least be regarded as much less serious than pneumonia. Thus, of 22 women, only 3 aborted in the fourth and sixth months, 3 were delivered prematurely about the eighth month, whilst all the others reached their full time; however, in nearly two-thirds of the latter, the pulmonary disease commenced in the early months of gestation, passed through all its phases, and produced a deep-seated cachexia.

With one exception, delivery was accomplished after four or five hours of suffering, which is explained rather by the relaxation and want of resistance of the soft parts, than by the small size of the children. Although the latter were generally feeble and emaciated, yet in more than a quarter of the number the tissues were firm, the form rounded, and of an embonpoint contrasting remarkably with the reduced condition of the mother.

In all the patients, except those who were in the last stages of consumption, and who died a few days or weeks after delivery, milk was secreted, and in the majority of cases so abundantly, that it was impossible to prevent them from nursing the children.

The flow of milk, however, lessened, or even ceased, within a period varying from one to four weeks; and even this short-lived lactation was always accompanied by a sensible aggravation of the disease, and had the most disastrous effects upon the children; for they died shortly after of softening of the intestinal mucous membrane.

From a very interesting memoir upon the same subject, by M. Dubrueilh, of Bordeaux, it appears that the result of his observations has been nearly the same.

In short, neither pregnancy nor delivery affect the progress of phthisis; nor does the latter disturb sensibly the course of the former.

8. *Hysteria; Epilepsy; Chlorosis.*—Some physicians have imagined that the occurrence of pregnancy might exert a favorable influence upon hysteria or epilepsy, either by suspending the attacks during the continuance of gestation, or even by ridding the patients of these affections entirely. Unfortunately these hopes have not been realized by experience; for although the convulsive attacks have seemed in some cases to be less frequent, or have even ceased entirely, in others, they have occurred much oftener than before. M. Malgaigne mentions a remarkable case in which the first epileptic attack came on during pregnancy in an unfortunate female who had never before been affected with it, and who retained it throughout her future life.

Marriage, and the consequent pregnancy, have often been recommended as the best means of curing chlorosis. When this disease appears to have been produced by disappointed love, the cause may, indeed, be thus removed, and the remedies directed against it rendered more efficacious. Pregnancy may, in this way, regulate the uterine functions for the future, cure the dysmenorrhœa, and consequently have a favorable effect when the irregular or difficult menstruation was the cause of the chlorosis. Under all other circumstances, however, pregnancy has seemed to me to aggravate the chlorotic symptoms. I, therefore, think it most prudent to defer marriage until after the general health of the patient is improved.

§ 5. SURGICAL DISEASES.

1. The pregnant condition often has a favorable effect upon scrofulous ulcers. Under the influence which it exerts upon the entire organism, glandular engorgements sometimes disappear, diseases of the bones are modified favorably, ulcers become clean and covered with bright, firm granulations, and cicatrization follows.

In many cases, it has appeared to arrest the consolidation of fractures. A curious instance of the kind is mentioned by Alanson. A woman broke her tibia when in the second month of her pregnancy, and during the seven succeeding months, the solidification made no progress. Nine weeks after delivery, the callus was strong enough to admit of walking. As proving that no constitutional depravation could be adduced in explanation of the retarded cure, he adds, that three months before impregnation, she had recovered rapidly from a fractured thigh. My friend, Dr. Fournier, cites three analogous cases from Dupuytren's Clinic. In all three, there was no consolidation before delivery, though it took place rapidly afterward. Though other similar instances are on record, it must be acknowledged that there is also a considerable number in which recovery did not seem to be delayed by the pregnant condition.

2. *Serious operations* have several times been performed during gestation without producing abortion, whilst in other cases they have had this result.

From these opposite facts, I think it fair to conclude that none but urgent operations should be performed, and that all others, such as fistula in ano, for example, which do not endanger the life of either mother or child, should be deferred to another time.

3. *Tumors in the Abdomen and Pelvis.*—Most authors think that tumors in the abdomen and pelvis during pregnancy, have no other effect than to impede mechanically the development of the uterus, or to present an obstacle to the delivery. (See *Dystocia.*) Sometimes, however, they assert, they may give rise to abortion or premature delivery, though, generally, they are not otherwise dangerous.

That this complication is of no danger, independent of the risk of abortion which it may occasion, cannot be admitted in an absolute sense. Dr. Ashwell has remarked, in his excellent work, that the uterus, when developed until term, exerts a strong compressing force upon the pathological tumor; that this compression may give rise to an inflammation ending sometimes in suppuration at the centre of the diseased mass, at others, in a rapid increase of the tumor immediately after delivery. I have several times had the opportunity of verifying the accuracy of these statements. Death may occur in a short time, as the consequence of this inflammation or rapid enlargement, and the autopsy has several times exhibited the uterus in a perfectly healthy state, together with the more or less extensive alteration of the pathological tumor.

Deeply impressed by the cases of this kind which he had occasion to observe, Dr. Ashwell asks, whether the development of the uterus, and the pressure which it exerts upon the neighboring tumor, are not the causes of the pathological changes of the latter, and consequently whether the induction of premature labor would not be the surest means of guarding against the dangers to which the female is so often exposed in these cases, even after having overcome all the difficulties of labor. When treating hereafter of premature labor, we shall have occasion to criticise the affirmative decision which he has come to; but we have thought it right to direct attention to a peculiarity but little known in the history of the tumors which complicate pregnancy.

4. *Intra-parietal fibrous tumors,* or those developed in the substance of the walls of the uterus, may exert an injurious influence upon the course of gestation, and become a cause of abortion when they are of large size; though, generally, they have no effect whatever when small. In the latter case, the physiological evolution of pregnancy may accelerate wonderfully the increase of the pathological tumor. The usually slow growth of these intra-parietal tumors is well known; now I have known them in several instances to acquire a size in the first three or four months, which they would not have done in several years in the non-pregnant condition. Developed as they are in the midst of the uterine fibres, they participate in the increased vitality with which the latter are endowed during gestation; and, like them, they undergo a considerable hypertrophy.

In some cases I have seen this hypertrophy of the morbid tumor continue, and even increase after delivery; but in others, the latter event was followed by a notable diminution of the size of the tumor, which gradually grew less as the womb resumed its normal condition, finally attaining the size which it had before conception. In one case, observed in 1852, this process of absorption went on, and the tumor disappeared.

[§ 6. HYPERTROPHY OF THE THYROID GLAND.

It is by no means rare for the thyroid gland to undergo hypertrophy during gestation apart from any endemic influence. The enlargement is generally slight and gives no trouble, though some women complain that their necks become large and unsightly. The swelling diminishes somewhat after delivery, though it rarely disappears entirely.

I knew one case in which the hypertrophied gland inflamed and suppurated, giving rise to an abscess which discharged for a long time; nor was the cure complete until after the lapse of several months.

Although this hypertrophy of the thyroid gland in pregnant women is not usually dangerous, it may in some very rare cases imperil the life of the patient. Two instances of this kind are related by M. N. Guillot. The first was that of a lady who was surprised during her first pregnancy to find that the front of her neck was gradually enlarging. When again pregnant, the swelling increased and became uncomfortable; still, the delivery was favorable, and she nursed the child for fourteen months. The gland, however, continued to enlarge, respiration became painful, and finally the symptoms were so threatening that tracheotomy was performed. The patient died.

In the second case, the hypertrophy also appeared during the first pregnancy and increased during the succeeding one, so that nineteen months after the second delivery it formed a tumor of about eight inches in circumference.

The breathing was obstructed, slow, and whistling, during both expiration and inspiration, and the voice was broken and painful. Paroxysms of suffocation came on, during one of which the patient died. At the autopsy the trachea was found to be flattened and the pneumogastric nerves compressed.

I witnessed for myself a similar case at the hospital of the Clinique in 1861. A woman, who for a long time had a goitre, found the tumor to increase rapidly in size during her first pregnancy. At the sixth month, respiration had become very difficult, and attacks of suffocation brought her to the hospital. By the end of the eighth month the symptoms were so severe that premature labor had to be induced, but the patient died in an attack of suffocation a few hours after delivery. My friend Dr. Tillaux, then prosector of the Faculty, dissected the tumor and found the trachea compressed by the enlarged gland.]

§ 7. ULCERATIONS OF THE NECK OF THE UTERUS.

It is rarely that cancerous affections of the neck of the womb seem to disturb the course of gestation, and the impediments which they but too often present during labor prove sufficiently that they are rarely a cause of miscarriage. On the other hand, I have never observed that the increase or degeneration of these tumors was sensibly hastened during gestation. Therefore, I shall treat no further here of this subject, reserving its discussion for the article on tedious labor; but propose to speak briefly of ulcerations of the neck during pregnancy.

It has been but a short time since surgeons have used the speculum in the cases of pregnant women. A just fear of the mischievous effect which might follow its repeated introduction prevented them from obtaining a correct idea of the condition of the neck at the various stages of pregnancy. These fears were, however, somewhat exaggerated, for, if introduced carefully, the speculum never causes serious accidents. In all cases, the instrument with two or four valves is, in my opinion, the best.

In default of great experience, there is considerable difficulty, no matter what instrument be used, in engaging the cervix in the extremity of the speculum, unless the situation of the neck is first ascertained by the touch. This difficulty is known to result from the fact of the direction of the cervix toward the anterior surface of the sacrum.

The engagement once effected, it is only necessary to separate the valves of the instrument slightly in order to bring the os tincæ into view.

As the touch should have led to anticipate, the changes which the eye detects in the intra-vaginal portion of the neck, are very different in the primiparous female from what they are in one who has had children; we would also add, that the appearance is far from identical at the beginning and termination of pregnancy.

As seen in the latter third of gestation, the neck is generally of a deep violet-red color; and, if it be a first pregnancy, is usually quite smooth throughout its extent; the external orifice is ordinarily more or less rounded, and though larger than in the unimpregnated condition, it barely permits the sight to penetrate its cavity, even though the valves of the instrument be separated considerably. The circumference of the external orifice and the free portion of the neck rarely exhibit signs of ulceration, though it is quite common to observe a series of granulations of a cherry-red color, of sizes varying from that of a large pea to that of a pin's head. These species of vegetations bleed upon the slightest touch with the cotton used for wiping them.

In the female who has had several children, the neck is usually much less voluminous, and it is somewhat difficult to include it entirely in the speculum. The lips of the os tincæ seem divided in several portions, a sort of segmentation caused by the ruptures which occurred in the preceding labors, and which give to the orifice considerable irregularity. In consequence of these numerous solutions of continuity, the opening is much larger, and is dilated with great facility, provided the valves be separated, thus allowing the eye to explore the cavity with readiness.

The walls of this cavity are very unequal, frequently presenting an uninterrupted series of fungous projections, separated by depressions of variable depth. Some of these projections are transparent, being formed probably by hypertrophied follicles; others resemble soft vegetations. The latter are generally covered by an intact epithelium, so that they may be touched without being made to bleed; again, what is by no means rare, they seem destitute of this external covering, and bleed upon the slightest touch.

It is more especially in the furrows which separate these, that linear ulcerations of variable depth are discoverable. These ulcerations sometimes extend over a considerable surface, and are then readily perceived, though they are usually concealed in the depth of the anfractuosities, and, in order to see them, it is necessary, after a thorough cleansing, to unfold the neck, as it were, by expanding the speculum considerably.

According to MM. Gosselin, Danyau, and Costilhes, these linear ulcera tions are much less frequent than I had supposed, and are met with in barely more than half the cases, whilst I had observed them in seven-eighths. However, as I stated very plainly, I intended to be understood as speaking only of multiparæ who had reached the latter months, whilst M. Gosselin includes in his statement all stages of pregnancy, and M. Danyau does not appear to have distinguished primiparæ from multiparæ.

Must we admit that, as M. Huguier supposes, we have been deceived? According to this gentleman, a muco-pus of variable consistence is frequently deposited in and adheres closely to the bottom of the furrows observed on the internal surface of the neck. This matter bears a complete resemblance to the bottom of an ulcer; but efface the folds and wipe them well, and the supposed ulcerations disappear. . . . . It is difficult for us to believe that we have been so deceived; still, the assertion of M. Huguier merits serious attention, and shall receive it hereafter.

Unless my observations have been for a long time subject to a series of singular coincidences, it is probable that what we have just described is the normal condition, and should not be regarded as pathological, but simply as a consequence of the progress of gestation. As the violet-red color, the swelling, the softening, and the almost fungous condition of the walls of the neck, are peculiar to pregnancy, and in no wise interfere with its progress, so I regard the ulcerations as a consequence of a physiological process, extreme in degree, and of no greater importance than the other physiological changes.

Especially am I convinced of their non-injurious character, and therefore regard all treatment employed against these ulcerations, even when *fungoid*, as much more hurtful than useful. I say, even *fungoid*; for, contrary to the opinion of M. Coffin, who attributes a great prognostic value to this character of the ulceration, I think that they are fungoid, not because they have a natural tendency to become so, but because the tissue which they affect always presents at a certain period the color and consistence of fungous tissue.

If, therefore, I am not deceived, and if the peculiarities just described really form a part of the pregnant condition, and are merely an exaggeration of the changes which the structure and vascularity of the walls of the uterus undergo at this period, the condition should disappear with the cause which produced it. Like the vomitings, varices, hemorrhoids, and other sympathetic disorders of pregnancy, it should disappear with it. Now this is exactly what happens, and it may be regarded as a principle, that no traces of it remain two months after delivery. The non-specific ulcerations sometimes met with in recently delivered women are of different appearance, and have their origin, in my opinion, in the non-cicatrization of the ruptures which took place during labor.

In short therefore, the fungous condition of the neck, and the ulcerations of greater or lesser depth which complicate this state of the parts near the termination of pregnancy, seem to me to be the consequence of the active or passive congestion with which the organ is affected. I think that, except in a few rare instances marked by specificity of character, or strong tendency to spread,—a tendency, by the way, which I have never observed,—all local treatment should be refrained from.

Is the case the same at a less advanced period, and are the ulceration which may affect the neck in the early months of an equally innoxiou character?

MM. Boys de Loury, Costilhes, Coffin, and Bennett, who have directed their attention more particularly to the ulcerations occurring in the first half of gestation, have been so forcibly struck with their tendency to produce abortion and puerperal diseases, that they class them with the most common causes of miscarriage. Mr. Bennett goes so far as to call them the *keystone* of all diseases of the pregnant female, and the most frequent cause of difficult labors, obstinate vomiting, (see page 465,) moles, abortion, and hemorrhage.

Notwithstanding the smallness of their number, the observations which I have been able to make differ so completely from the results obtained by these gentlemen, that I was tempted to accuse them of some exaggeration. Hovever, after having heard MM. Huguier, Gosselin, Danyau, Cloquet, &c., proclaim the innocence of these ulcerations, I have no hesitation in saying that they have misconstrued the facts observed by them. Finally, we would add, that after having read their observations, there seemed reason for inquiring whether, in many cases, syphilis may not have been the principal cause of the accidents, and in others, whether the frequent introduction of the speculum and the numerous cauterizations which had been practised, may not have played the most important part in the production of the abortions.

I ought, perhaps, to except the peculiar species of ulceration described by my friend M. Richet. All the varieties of ulceration, says this learned surgeon, which are observed in non-pregnant women, may occur during pregnancy; but it has seemed to me that they had a tendency in some cases to assume a fungous character, to excavate the lips of the cervix, to bleed readily, and give rise to serious accidents: abortion, for example. In all my patients, these ulcerations with well-defined edges, and red and bleeding bottoms, were covered with reddish fungosities, which projected between the partly opened lips of the cervix. Of six patients, four miscarried, and two left the hospital apparently cured; of the four who aborted, one only had been cauterized, the three others not having undergone any treatment.

Whoever, like myself, has examined women at the end of gestation, will find the ulcerations observed by M. Richet in the early months, and which he has had the kindness to show me, to bear a close resemblance to those sometimes met with in the latter stages. I see no difference except in the rather greater extent of the ulceration. Their size leads me to suppose that their origin dates back long before impregnation, and their sharp, well-defined edges excite a suspicion of their being specific in character (five of these six women had syphilis at the time, or had previously been affected with it). Now we may readily conceive that under such circumstances the softening, congestion, and fungous condition which pregnancy usually produces at an advanced period, may here take place prematurely, and give to the ulcerated tissues the livid hue and fungous aspect described by M. Richet. Thus, we may understand how such an affection of the cervix, connected most frequently with a general disorder, under whose influence it has a constant tendency to increase, may ultimately give rise to abortion. It also seems to me important to distinguish the ulcerations which existed before pregnancy, and continued, and even increased after conception, from those which were developed after the formation of the germ: the former, in consequence of the irritation which they may suffer as a consequence of fatigue, and especially of too frequent coition, might readily excite the contractility of the uterus and occasion miscarriage; the latter, on the contrary, should, it seems to me, rarely exert such an influence.

I agree, therefore, with the opinion of M. Richet, that when an ulceration presents in the first half of gestation, possessing the characters which he describes, and which, in my opinion, are an evidence of its chronicity, miscarriage should be anticipated, and means be taken to prevent it. Now, aside from a specific treatment in those cases which indicate it, I may be allowed to ask of those who would have these ulcerations treated as a matter of necessity, what are the best local means to be used? Which caustic is preferable? Is not the solid nitrate of silver accused of producing abortion by the partisans of the caustic of Filhos, of the acid nitrate of mercury, or of the actual cautery; and has not each of these latter means also been reproached with giving rise to miscarriage? The thesis of M. Coffin affords some curious details on this subject, and evidently proves, that though cauterization by any agent whatever may claim some doubtful successes, the latter are generally compromised by the abortions which have followed it. From the statements of Bennett and Boys de Loury, the same inference follows. M. Coffin himself, though attributing such great importance to these ulcerations, arrives at this discouraging *therapeutic conclusion*, viz., thus far, no treatment has succeeded, and the question remains open. This, which was true in 1851, is so still; for quite recently we heard M. Chassaignac speak emphatically of the inefficiency of all methods, and M. Richet declares himself undecided as to the best course to pursue.

The insufficiency of local treatment, and the mischievous effect which it may have upon the progress of gestation, should, it seems to me, in the present condition of science, lead us to dispense with it whenever the ulceration has no marked tendency to invade a large extent of the cervix.

CHAPTER II.

DISEASES OF PREGNANCY.

THOSE who have studied the various affections of the womb are well aware that its diseases excite numerous sympathetic disorders. The commencement of the physiological acts which devolve upon it, and their periodical fulfilment, exert upon the functions of the alimentary canal, and upon those of the nervous system, an influence which has for a long time attracted the attention of practitioners. It were useless to mention all the morbid phenomena which so often precede, accompany, and follow the first menstruation. These are more striking when the latter is postponed or difficult. In some individuals they appear at each menstrual period for a long time, thus seeming to show an impossibility on the part of the organ to perform its functions without occasioning extensive disturbances of the economy; and it is only, so to speak, when the sensibility of the womb has been blunted by habit that the return of the menses ceases to produce the general disorders which accompanied it previously.

If the diseases of the organ, and even the simple monthly congestion, are capable of giving rise to such troubles, it is easy to foresee that pregnancy, which changes simultaneously the form, size, and even the structure of the uterus, can hardly pass through its various periods without deeply affecting all the functions.

The effects produced by the pregnant condition vary greatly, as regards both the degree and the nature of the symptoms; all of them being influenced by the constitution of the female. Occasionally, it results in a salutary change in the entire system, better health being then enjoyed than at any other period. In the majority of cases, however, tiresome, or at least very disagreeable symptoms are experienced, which are the expression of the unpleasant influence exerted by the uterus upon important functions. These troubles, which are so slight in some individuals as to amount merely to discomforts, are, in other cases, so great as to injure their health, and even to excite fears for their existence.

These accidents may appear at almost any time; for though some persons begin to suffer at the very outset, and are relieved by the third, fourth, or fifth month, others are attacked only in the latter half of gestation.

The pregnant condition operates differently at the different periods of gestation, in the production of the accompanying discomforts or diseases; this fact, which is important in a therapeutical point of view, was felt vaguely to be so by Burns, but clearly expressed by M. Beau, who, I think, has thrown much light upon the pathology of pregnancy.

Most of the functional disturbances may occur in the early, as well as in the latter months. At first they were regarded as the result of the numerous sympathies existing between the uterus and the digestive apparatus, and, at a later period, the purely mechanical difficulties produced in the neighboring organs by the pressure of the uterine tumor were thought to assist in their production. Now, the pressure of the womb is of quite secondary importance, if, indeed, it be of any whatever; for, according to M. Beau, the following is what usually occurs: The womb, as modified by pregnancy, affects the digestive functions through sympathy, giving rise to the dyspeptic symptoms described hereafter. The disturbance of these results necessarily, if prolonged, in deficient nutrition, which, in a woman who is obliged to furnish the material for the development of the child, must soon occasion a greater or less diminution of the blood corpuscles, and a considerable increase of the serum; in short, to all the anatomical characteristics of chlorosis or polyæmia.

Now, this impoverishment of the blood soon occasions new morbid symptoms in the pregnant woman, as well as in the young chlorotic female, and so serves to explain the reappearance of the disorders of digestion, vertigoes, headaches, congestions of the face, palpitations, and difficult respiration, so frequently observed at an advanced period of pregnancy. We thus see that the functional disorders, which at the outset are purely sympathetic, become afterward intimately connected with the chlorosis which they themselves helped to produce. (See *Disorders of the Circulation.*) Though we shall have occasion to treat hereafter of this latter etiological peculiarity, we cannot help calling attention, at present, to the importance of taking it into consideration in the choice of remedial measures. For, though it be proper at the commencement to reduce the over-excitement of the uterus, and the sympathetic irritation produced by it in other organs, by soothing remedies, as baths, mild laxatives, antispasmodics, and sometimes even by moderate blood-letting, an entirely different course should be pursued toward the end of gestation. All the restorative agents, as iron, animal food, and tonic wines, are here the surest means of opposing the plethora and removing the disorders which it occasions. Still, it is right to observe, that beside the chlorosis, which plays the principal part in the production of the disorders of the latter months, the uterus still retains its sympathetic influence, and is subject at all times to congestions, which increase its irritability, and cause it to react upon other organs; of all which account should be taken in the treatment. The subject will claim attention hereafter.

Finally, the connection which we have endeavored to demonstrate as existing between the sympathetic troubles of the beginning of pregnancy and the chlorosis of the latter months, cannot always be readily discovered. The sympathetic influence of the uterus upon the digestive functions is not always manifested by vomitings, nausea, and strange and depraved appetites. All these symptoms may be wanting, and yet the stomach fail to perform its functions with its normal regularity. Nutrition may be disordered, giving rise to a dyspepsia, which M. Beau proposes to distinguish as *latent;* a dyspepsia which cannot fail to occasion eventually a general deterioration of the blood. Exactly the same thing occurs in young girls whose menstruation is either difficult, irregular, or imperfect. Confirmed chlorosis is always preceded in them by sympathetic disorders of digestion; though sometimes the deranged function is evinced by very marked symptoms, at others it is hardly a cause of discomfort.

Desormeaux, in his excellent article on this subject, ranges all the diseases of pregnancy under the following heads, viz.: lesions of digestion, of circulation, of respiration, of the secretions and excretions, of locomotion, and of the sensorial and intellectual functions. And we propose partly to adopt the same order in our description.

ARTICLE I.

LESIONS OF DIGESTION.

§ 1. ANOREXIA.

The want of appetite, or the disgust for aliments, which pregnant women are so often affected with towards the end of gestation, and still more frequently at its commencement, may be referred to various causes, and consequently will present different indications for treatment. When it seems to result merely from the sympathetic relations existing between the uterus and the organs of digestion, there is little or nothing to be done, for it would be in vain to attempt removing the disgust which some patients have to certain articles of food. In general, they dislike all meats, and this is an indication, or rather an obligation, to permit the use of vegetables in such cases. Again, if at an advanced stage, the anorexia be accompanied or preceded by the phenomena of general plethora, venesection, proportioned to the general condition of the female and the stage of pregnancy, may relieve it. Care, however, should be observed not to mistake the symptoms produced by anæmia for the indications of plethora; the former being far more effectually treated by ferruginous preparations. (See *Disorders of the Circulation.*)

In those cases which exhibit evident signs of an overloaded condition of the alimentary canal, some purgative, such as rhubarb, or even the neutral salts, may be administered. Indeed, certain authors have recommended an emetic, when there is any gastric distress; but I think practitioners ought to be very reserved in the employment of this last measure, since the shock of vomiting has often produced abortion.

§ 2. PICA, OR MALACIA; PYROSIS.

Pica, or malacia, frequently accompanies the affection just described. Pregnant women, like chlorotic girls, often have irregular and depraved longings for the most absurd or disgusting articles. For instance, I have known a young female to eat pepper-grains almost continually. Another, at the Clinique, scraped the walls to appease her cravings for chalk; and M. Dubois often relates in his lectures the history of a young pregnant woman whose greatest pleasure consisted in eating small bits of well-charred wood. Again, they have been observed eating greedily substances that are still more disgusting. Unfortunately, all our persuasions are useless with such monomaniacs in the majority of instances, and consequently we must, as a general rule, grant them an indulgence, and avoid too strong an opposition, unless the coveted articles would evidently be injurious to their health.

I have but little to say of the acidity of stomach, of the spasmodic pains of that organ, and of the pyrosis and other symptoms of gastralgia, which are also quite frequent during pregnancy. The treatment of the symptom is here the same as under ordinary circumstances. Thus, for sour eructations and acidity of the primæ viæ, magnesia and the absorbents, bicarbonate of soda, the water and pastilles of Vichy, may be administered. Pyrosis and cramps of the stomach are usually treated successfully by powdered columbo, and most of the antispasmodics, in connection with small doses of opiates. The latter may also be used after the endermic method.

If, however, it be desired to attack the first cause of these gastralgic symptoms, it is important to remember that this is different for the first and second half of gestation, and that the measures employed should vary accordingly.

§ 3. VOMITING.

The vomiting of pregnancy presents two different forms. In the first it occasions discomfort and fatigue, without endangering life. In the second, it is sometimes so severe as to prove fatal. The first we shall term *simple vomiting;* the second, *grave* or *irrepressible vomiting.*

1. *Simple Vomiting.*—This symptom is so common that most females are affected with it; in fact, vomiting frequently commences in the very earliest stages: whence many women, taught by their former pregnancies, recognize it as an almost certain sign of a new gestation. At other times it does not appear until toward the third or fourth month, though seldom later than that; but it is not at all uncommon to see it reappear near the end of pregnancy in some who had been previously tormented in this way at its beginning. As an ordinary rule, the vomiting only lasts six weeks or two months; sometimes, however, it extends over four or five months, rarely persisting throughout the whole term. Some females have the unenviable privilege of vomiting every time they are pregnant; others, more fortunate, pass through several gestations without feeling any digestive disorders whatever. It is a very remarkable fact, if we may rely on the testimony of numerous mothers, that the sex of the child is not wholly irrelevant to the production of this symptom; and however ridiculous this may appear at first sight, I have heard it repeated by so many women that I cannot refrain from believing that it, like most other popular prejudices, has some foundation.

But what is the cause of such vomiting? When it occurs near term, we may justly attribute it to the pressure, to the mechanical constraint which the uterus, whose fundus reaches the epigastric region, exercises upon the stomach; but in the early stages it is much more difficult to explain it unless we content ourselves by referring it to the numerous sympathies existing between the uterus and the stomach: sympathies so intimate that they are manifested in certain women at every menstrual period, and even in nearly all those afflicted with a disease of the womb.

Although the intimate nature of these sympathies is very obscure, we can admit them more readily in the etiology of vomiting than the influence of most of the anatomical causes adduced by some authors. In endeavoring to trace a relation of causality between the vomiting and an inflammation of the uterus, placenta, and membranes, like Dance; softening of the stomach and fatty degeneration of the liver, like Chomel; or, finally, to the existence of organic lesions of parts in the neighborhood of the uterus, observers have merely noticed simple coincidences, without throwing the least light upon the question of etiology. How often, indeed, is nothing of the kind discoverable!

I am persuaded, says Dr. Bennett, that those gastric disorders and obstinate vomitings, which so often bring women to the portals of the tomb, are almost always caused by inflammatory ulcerations of the neck of the womb. For my own part, he adds, since my attention has been directed to this subject, I have *almost invariably* found ulceration of the neck in cases of this kind.

I cannot receive this opinion of the English accoucheur, at least as relating to the majority of cases, for I have frequently examined with the speculum each of four primiparous women affected with incorrigible vomiting, and in whom I ascertained the cervix to be perfectly healthy.

It has been said that primiparous women are more subject to vomiting than others, on account of the uterus yielding less readily to distention in first pregnancies.

Although this opinion is quite conformable to the theoretical views already given, the fact is, that it is liable to very frequent exceptions. Some multiparæ, who suffered very slight disorders of the stomach in their first pregnancies, have vomited almost constantly in later ones. The rigidity of the uterus is not, therefore, the only cause which is capable of sustaining an irritability of the organ which reacts sympathetically upon the stomach.

I do not think that an epidemic influence can be admitted as a cause of these vomitings.

The vomiting varies much as regards its frequency, intensity, and the greater or less ease with which it is accomplished.

Thus, some women vomit only upon awaking or rising in the morning. They then throw up some viscid or glairy matters, which are generally colored with a little bile, especially if the retchings have been very severe. Others vomit only after eating; occasionally after only one of the daily meals, but sometimes after all of them. Again, in some unfortunate cases it continues even in the intervals of the repasts; everything taken into the stomach, whether liquid or solid, being immediately rejected. There are cases, finally, in which the mere thought of food, or the sight or smell of it, is sufficient to provoke it.

The vomiting is sometimes easy, and causes little pain; it is indeed not uncommon to find ladies suddenly interrupted at their meals, who can return in a few minutes, and sit down and eat with a good appetite and pleasure.

In other cases, however, the ingestion of food is productive of pain in the stomach or inexpressible uneasiness of variable duration, and it is only after five or six hours of suffering, that the food is vomited and then found to be almost unchanged, notwithstanding its long retention in the stomach. In such cases the vomiting is preceded by such prolonged and violent retchings as to reduce the patient to a state of extreme suffering and agitation.

It is occasionally followed by considerable epigastric pain, which is increased by pressure, and might for a moment be taken as a sign of inflammation of the stomach; it gradually diminishes, however, and disappears entirely after a time. The shocks and violent efforts sometimes extend their influence to the hypogastrium, and give rise to abdominal pains and even uterine contractions, which may be active enough to produce abortion.

But it must not be supposed that vomiting, even when prolonged and oft repeated, is necessarily disastrous. No doubt many women waste away, but I have often satisfied myself that the emaciation is not apt to be excessive, by examining females who, according to their own expression, could retain nothing at all; and hence it is exceedingly probable that all the food taken by them is not rejected.

Burns states that he has never known vomiting depend on pregnancy alone to have a fatal termination. I might cite, says Desormeaux, examples of emesis accompanied by cruel pains and violent general spasms, yet the gestation has happily gone on to full term. At this time, I have myself under care a lady who has been vomiting throughout the whole period of gestation, and who has just been delivered of a daughter weighing seven pounds and three-quarters.

Finally, it must not be forgotten that in some cases which even appear serious, the vomiting may cease abruptly, either spontaneously, or because the sympathetic irritation of the uterus has been translated to some other organ, or again, as a consequence of a violent mental emotion. A remarkable instance of the latter has quite recently come under my notice. A young lady, two months and a half advanced in her pregnancy, had been tormented for three weeks with such obstinate vomiting, that, according to her own statement, the smallest mouthful of fluid excited it, and that she was unable to retain anything whatever in her stomach. All the remedies employed against it had proved useless. At this juncture, her husband fell suddenly and dangerously ill with symptoms of strangulation of the bowels, and from this time her vomiting ceased, nor did she suffer the least disturbance of her digestive functions afterwards.

I have been induced thus to hold forth from the outset a favorable prognosis, which indeed is true for the vast majority of cases, in order to relieve young practitioners from the anxiety which some recently published articles on the gravity of this affection are calculated to produce.

2. *Grave or Irrepressible Vomiting.*—The vomiting is not, generally, serious, but only painful and fatiguing to the mother; it must, however, be acknowledged that in some very rare cases, it is so violent and constant as to exhaust the strength of the patient in a few weeks, and after producing extreme emaciation terminate in death.

The display of symptoms given by M. Chomel in one of his clinical lessons, applies to these exceptional cases only. The disease, he says, is characterized by frequent bilious vomiting, an acid, fetid breath, and fever; then the brain becomes involved, and we have delirium, coma, and death.

The views of M. Dubois correspond closely with those of M. Chomel, and, like him, he describes three stages.

[A. *First Stage.*—The irrepressible form of vomiting rarely begins suddenly, but almost always follows insensibly the simple form. The time at which it commences is very variable. Generally appearing during the early months, it may not come on until after the middle of gestation. In 43 cases collected in the excellent thesis of M. Guéniot, hospital surgeon, and former chief of the lying-in hospital, and from which we shall borrow largely, vomiting occurred 9 times during the first weeks of pregnancy, 15 times toward the end of the first month, 9 times between the first and second months, 5 times between the second and third months, 1 time between the third and fourth months, 2 times between the fourth and fifth months, and 2 times between the sixth and seventh months. The first of the cases enumerated are of the early and benignant form, and it is impossible to distinguish accurately the period of transition from the simple to the graver form.

The irrepressible cases present in themselves nothing very characteristic. The vomiting, however, is very frequent, and occasions the rejection of all or nearly all the food and drink which the patient takes. The smallest quantity of fluid is often sufficient to excite it.

The dejections in these cases are composed of mucous or glairy matter, bile or food, according as the bowel happens to be full or empty. Generally they are very acid, and sometimes streaked with blood.

To these symptoms may be added a disgust for or aversion to food, so great as to be often insurmountable.

Soon appear the grave signs of insufficient nutrition: emaciation, debility, altered features. Certain accessory phenomena may also complicate the situation, such as the almost constant ptyalism indicated by Stoltz and Vigla, and confirmed by an observation of my own.

The first stage is devoid of fever, unless it be a little febrile action in the evening and slight perspiration during the night. We invite attention to this fact, inasmuch as fever is the dominant symptom in the second stage.

B. *Second Stage.*—In this period the symptoms of the first stage grow more severe; the attacks of vomiting are more frequent and violent; the emaciation increases; finally, fever sets in with a pulse of from 100 to 140 per minute. The mouth becomes dry, the thirst is intense, the breath acid and fetid. The acidity and fetidity of the breath are such, says M. Chomel, as to strike one on entering the room of the patient. Still, should we consult our personal experience, we should say the odor is uncommon, inasmuch as we have never observed it in the many cases of irrepressible vomiting which we have seen.

C. *Third Stage.*—In this stage the symptoms undergo a change, the attacks of vomiting ceasing or becoming less severe; but it is a deceitful calm which the experienced physician knows to be the prelude to death. There will, however, be no risk of deception if we but observe that the fever persists with a pusle of from 120 to 140 pulsations per minute. Attacks of syncope and cerebral symptoms soon come on. These are: intolerable neuralgic pains, disordered sight and hearing, hallucinations, delirium, and, finally, coma, which ends shortly in death.

D. *Progress, Duration, and Termination.*—The paroxysms of the graver form of vomiting often remit more or less completely; the remissions being sometimes, as it were, spontaneous, or in consequence of almost insignificant circumstances. Thus an emotion, travel, some change in the mode of life, a new article of food, and numerous similar eventualities seem occasionally to produce a transient amelioration, or even a momentary cessation of the symptoms. The hope thus excited is, unfortunately, but too soon destroyed by a more or less rapid recurrence of the disease. (Guéniot, *Thèse de Concours.*)

At other times these remissions may be attributed to the use of a remedy whose action is exhausted, or the momentary cessation may follow and be due to premature labor or abortion. Then the vomiting returns with increased severity.

The progress of this terrible affection is usually slow, as the patients do not generally succumb until after the second or third month of the disease.

E. *Etiology and Pathological Anatomy.*—We know nothing of the causes of irrepressible vomiting. Some have attributed it to albuminuria, an opinion which nothing goes to confirm, and which would hardly be adopted were it remembered that vomiting is most frequent at the beginning or middle of pregnancy, whilst albuminuria is rarely observed except during the latter months.

Of the silence of pathological anatomy in regard to this disease, I have lately had an additional proof.

A woman with irrepressible vomiting entered my ward, at La Pitié, where I was temporarily on duty. She was delivered spontaneously during the eighth month, but, after a remission, the symptoms reappeared, and she died a few days subsequently. The autopsy, conducted with the greatest care, discovered no lesion in any organ; the genital organs, the abdominal and thoracic viscera, and the encephalon, being perfectly healthy.]

F. *Diagnosis.*—In moderate cases the diagnosis is easy. Here, the absence of acute symptoms, such as redness of the tongue and pain upon pressure on the epigastrium, would settle the question, even were pregnancy doubtful. But if, in the cases just spoken of, the nature of the epigastric pain be misunderstood, the practitioner would be more liable to error; therefore he should be very careful in his proceedings. For example, I ave known a case of vomiting, which the autopsy proved to have been lependent upon tubercular peritonitis attributed to a pregnancy which did ot exist. In the case of another female, who had actually been pregnant or two months and a half, the examination after death discovered a serious lisease of the stomach, amply sufficient to account for the vomiting. In he latter case, it is true, that an admixture of blood with the matters vomited, had, during life, excited suspicion of organic disease. This very case has, however, been quoted to me by some persons as one of incurable vomiting occasioned by pregnancy. Mistakes of this kind ought not to be made, and the same may be said in regard to epigastric and other hernias.

[a. *Prognosis.*—The prognosis in the grave form of this affection is serious. In 118 cases collected by M. Guéniot, there were 72 recoveries and 46 deaths, represented as follows:

Recoveries.	
Without abortion in very severe cases and after a very diversified treatment	31
Following spontaneous abortion, also in very severe cases	20
After abortion or induced labor in cases more or less desperate	21
Deaths.	
Without abortion	28
After abortion or spontaneous premature labor	7
After procured abortion	11

It is but just to say, that in this table of mortality, M. Guéniot included all the cases he was able to collect, and that amongst them are some in which death was evidently due to some other disease than the vomiting itself.

Cases of irrepressible vomiting are serious from the outset, inasmuch as, notwithstanding all the modes of treatment employed, abortion included, it is impossible to know whether they will be certainly arrested.

The prognosis becomes still more unfavorable in the second stage of the disorder, for when the patients are much debilitated and the fever constant, some will succumb without having either the fetid breath or cerebral disorders. Of such cases, two have come under my notice.

In the last stage, death is almost inevitable, and we ought not to be deceived by the remission of vomiting which then occurs. It should also be borne in mind that the cerebral symptoms which accompany this phase of the disease are various. In two cases, I observed only a little hebetude and slight strabismus without other nervous disturbance: so that, before reaching the correct diagnosis, typhoid fever, or a cerebral tumor might be suspected.]

Generally speaking, even when the vomiting is not so great as to compromise the life and health of the mother, it has but an indirect influence upon the life of the child, nor do I know of a single well-attested case of death of the fœtus from inanition through defective nutrition of the mother.

Still, we may understand how the violent efforts of the mother may sometimes communicate such shocks to the uterus as to bring on premature contractions and even abortion. We can also comprehend how the same efforts may produce vascular congestion of the womb, giving rise to rupture of some of the utero-placental vessels and detachment of the placenta; such accidents are, however, rare. In grave cases, results of the kind are rather to be desired than deprecated, for vomiting generally ceases upon the death of the fœtus, and the mother escapes the threatened danger.

3. *Treatment of the Vomiting of Pregnancy.*—There are but few medicines that have not been proposed, at one time or another, for this affection of pregnant women; and at other times recourse has been had to surgical procedures. We will, therefore, examine successively the medical and surgical treatment.

A. *Medical Treatment.*—When the emesis is slight, and only occurring in the morning, we may recommend an aromatic infusion of the lime-tree, orange-flower, common tea, &c., &c. Where it comes on after a meal during the day, it is advisable to change the order of the repasts: for example, if it be generally more distressing after supper, the patient should sup sparingly and eat more breakfast. Cold aliments are sometimes retained when others are rejected. Iced drinks, mineral waters, and swallowing small pieces of ice, have arrested some cases of obstinate vomiting, which set at defiance the whole series of antispasmodics. The subnitrate of bismuth, in doses of from four to eight grains, before each meal, has appeared to me of late to be of some service. I have also directed two or three spoonfuls of kirsch to be taken after meals, and I think with some success. Should it persist, notwithstanding these measures, a resort may be had to a remedy, which has often succeeded perfectly in my hands,—I allude to the narcotics. About an hour before the meal, let her take one-third or one-half a grain of the aqueous extract of opium made into a pill; but when she is constipated, it will be necessary to administer some mild purgative to counteract any action the opium may have on the large intestine.

Whenever the emesis is attended with pain and stricture at the epigastrium, leeches have been recommended over this part, though I have rarely seen their application followed by any benefit. I should prefer laudanum lotions, or the application of a cataplasm well tinctured with this fluid. Sometimes I have successfully applied a small blister to the epigastrium, and subsequently sprinkled the sixth or the third of a grain of the muriate or acetate of morphia over it.

M. Dezon mentions three cases of obstinate vomiting, which yielded to the continued application to the epigastrium of a towel wet with cold water and renewed every five minutes.

If the vomiting occasions pains in the loins or hypogastrium, in a word, if it threatens an abortion, or if the patient be plethoric, and this condition is manifested by local or general phenomena, venesection in the arm should be resorted to, as this is one of the best measures I am acquainted with, especially during the last half of gestation. Enemata containing laudanum are also very useful for the prevention of abortion, as well as for alleviating the vomiting, and calming the irritability of the uterus. General bathing may be added to these measures with advantage.

Dance reports two cases, from which he feels authorized to conclude that these vomitings are often an evidence of a morbid activity in the uterine system, of an inflammation of the membranes; and consequently he advises direct antiphlogistic measures, especially in the neighborhood of the womb; but as his opinion is founded on two cases only, which, after all, are not conclusive, it seems to me that it cannot be admitted as a rule of practice. Still, leeching the neck of the uterus yielded unlooked-for results in cases of Ch. Clay and M. Clertan (of Dijon).

With regard to the regimen, doubtless a mild liquid diet, composed of aliments that are easily digested, seems at first to possess decided advantages over all others; but how many exceptions! how many women reject the mildest articles—even liquids, and yet readily digest less suitable substances! How often, indeed, have I not seen women eat ham, liver, pie, &c., who could not digest a piece of sole, or the white meat of fowl! Of course, we must respect these peculiarities of the stomach.

Among the various measures recommended, but which I have rarely had occasion to resort to, may be mentioned the application of cups to the pit of the stomach (Mauriceau); of a plaster of theriaca (Sydenham); a few spoonfuls of sherry-wine, or even some brandy, ether, peppermint-water, the potion of Riviere, and the colombo root.

In those cases in which there was some degree of regularity in the return of the pains, and febrile action, Desormeaux gave two or three grains of the dry extract of cinchona with success. Lastly, Walter and Blundell have highly extolled the use of hydrocyanic acid in the dose of one or two drops, in some mucilaginous drink, several times a day. With the same idea, I have successfully given kirsch after meals, either undiluted or on a lump of sugar. The latter plan has seemed especially useful when the vomiting was preceded by uncomfortable sensations in the stomach or long-continued nausea—a state of things resembling sea-sickness.

To overcome the acidity of the primæ viæ, M. Chomel recommends the use of alkalies, as the water from the springs of Vichy and Bussang; also dilute solutions of potash and soda, magnesia with milk, but never milk alone, and an avoidance of acids.

Alcoholic liquors, given to the extent of intoxication, have met with real success. M. Rayer tells me that he has used them with great advantage, and champagne wine, recommended by M. Moreau in a case so obstinate as to cause great frequency of pulse and delirium, put an end at once to the symptoms. M. Jacquemin, who related the case to me, considered the patient as lost, and had only called the professor in consultation, in order to obtain his opinion in regard to the propriety of producing abortion.

M. Bretonneau, being induced to try belladonna, in the idea that possibly the vomiting might be occasioned by rigidity of the uterus, succeeded in quieting it, even in very grave cases, by rubbing the abdomen with a concentrated solution of that medicament.

In one very serious case, in which the vomiting had resisted every effort, even Bretonneau's measure, and in which the poor patient seemed doomed to a speedy death, I conceived the idea of applying the belladonna to the neck of the uterus; this was done by means of the speculum. A brush, laden with the soft extract, was introduced, and the neck, together with the inferior segment of the uterus and the walls of the vagina, were besmeared with it. From this moment, a marked change for the better was manifest, and after the same unctions had been repeated on four successive days, I had the satisfaction of finding my patient cured. It is my duty to add, that in another case the same means failed completely, though I think the failure due to the mode of application. When, as in this case, a brush is used, it is difficult to apply the ointment, and too little of it is sometimes left behind. I have, therefore, for a long time preferred covering a tampon of charpie or cotton with the extract of belladonna, and, after placing it in contact with the cervix by means of a speculum, leaving it there. This may be done morning and evening. The first symptoms of intoxication, such as dilatation of the eyelids, a sense of heat in the throat and slight hallucinations, need occasion no alarm, inasmuch as the effects of the medicament are not felt until then. The patient ought, however, to be watched, and the tampon removed if the symptoms become more serious. This method has been thrice successful in my hands.

M. Stackler overcame the vomiting in two cases by the black oxide of mercury, in the dose of one grain daily. The prolonged use of the remedy was unaccompanied by salivation.

[Iodine in various forms has been recommended. Eulenberg (of Coblenz), following the example of Schmidt, has used the tincture successfully, whilst Ricord and Bacarisse derived equal advantage from iodide of potassium given to the amount of from ten to fifteen grains daily.

"Simpson," says M. Guéniot, "found the salts of cerium very efficacious, especially the oxalate, in 45[1] grain doses three or four times a day. I would add that the latter salt failed entirely in a case related by M. Danyau, in which it was used by him and M. Dubois, nothing short of a partial detachment of the ovum sufficing to relieve the patient from the danger which menaced her."]

The obstinate constipation which the patients suffer is very remarkable, and has not received the attention it deserves. The bowels sometimes remain unmoved for eight, ten, or even fifteen days. Strongly impressed with this fact, and supposing that the constipation might have some effect upon the continuance of the vomiting, I endeavored to overcome it; but, fearing the effect of emetics or drastic purgatives upon a weakened and pregnant female, my first efforts were too cautious to be successful. Encouraged since then by the experience of other practitioners, especially by M. Forgue, of Etampes, I have had every reason to be satisfied with a bolder course.

The above-named physician addressed to the Academy of Medicine a memoir, in which he lauded the effect of emetics and purgatives, but insisted much upon what he called a *preparatory treatment*, consisting in the administration to the patient for two or three days, a ptisan of barley-water, weakened with honey, to each quart of which he adds a drachm and a half of sulphate of potash; giving also, morning and evening, an enema of a strong decoction of *mercurialis annua*. When some stools have been thus obtained, he orders a bottle of Seidlitz water containing a grain and a half of tartar emetic, after which he continues the purgative for several days longer. M. Forgue claims to have treated five cases successfully by his method.

In endeavoring to try this plan, I have always found it impossible to overcome the dislike of the patient to drinking enough of M. Forgue's ptisan (about two quarts in twenty-four hours). I am, therefore, in the habit of

---

[1] The translator ventures to suggest that the dose of oxalate of cerium here described ("3 grammes") may be an oversight on the part of the author or printer, it being his impression that it greatly exceeds the dose recommended by Dr. Simpson. It might stand "3 grains."

metic at once, when the saburral condition of the tongue seems
it: which is not often the case. Generally, I order at once ten
ammony with fifteen grains of jalap. As the first dose is often
vomiting, I order it to be followed immediately by another, and
ven by a third, should the vomiting continue.

d or third dose is generally retained, and the purgative effect
a marked relief.

e of a patient two months and a half advanced in pregnancy,
was called in consultation by Dr. Briau, Professor Moreau dis-
he touch that the uterus was not only completely retroverted,
as it were, in the depths of the pelvic cavity. Suspecting that
ment might have some effect to maintain the vomiting, he cor-
lifting the uterus above the superior strait and bringing it into
nce with its axis. Immediate relief followed, and the vomiting,
roved intractable to a host of remedies, ceased on the same day,
ain return.

u said, that he had seen several similar cases. I had indeed
re this, observed the same accident, but not having acted upon
n, our Honorable master conferred a real service in making
ortunate result which he had thus obtained.

therefore, the state of the uterus should be ascertained in all
rrigible vomiting. Experience has, however, taught me, that
placement of the uterus often coincides with gastric disorder,
good fortune is not always to be expected. Three times since
ase have I observed the coincidence indicated by my colleague.
ients suffering from obstinate vomiting, I found the uterus not
as in M. Moreau's case, but so far anteverted that the anterior
e womb projected considerably at the upper part of the cavity,
rder resting against the posterior face of the pubis. The reduc-
easily accomplished, could not be maintained, and the organ
sumed its primitive position. Several attempts at reduction
unsuccessful.

, was I less fortunate than M. Moreau? I am inclined to think
se of the different stages of pregnancy in our patients respec-
t of M. Moreau had reached three months or three months and
of mine were only two months gone. Now, if at three months
he size of the uterus is sufficient to keep it above the superior
eduction, and that it can only, in some exceptional instances,
o the cavity, the case is very different at an earlier period. At
in fact, the uterus is so much smaller, and therefore so much
le, that it yields readily to every cause of displacement brought
it, and, as though by the force of a bad habit, readily resumes
ition when the restoring effort is no longer made.

, therefore, in reference to M. Moreau's plan, to have great
e duration of the pregnancy; very efficient after the third
l generally be useless at six weeks or two months. Unfor-
appens that incorrigible vomiting is more apt to occur at the

All my efforts to remedy the difficulty by means devised for keeping the uterus in situ after reduction, have been fruitless. I had made an elongated compress, which, when placed above the pubis, depressed strongly the wall of the hypogastrium, and at first seemed to keep the womb in place. Soon, however, it slipped beneath the pad, fell back into the pelvic cavity, and as the bandage thenceforth did more harm than good, I was obliged to give it up.

It was natural to think of Gariel's pessary, but I dared not keep so large a body in the vagina of a pregnant woman, lest it should have the effect on the uterus of a tampon which so often causes abortion or brings on premature labor.

In short, M. Moreau's success in the case related by M. Briau, is an encouragement to make similar attempts, as, after all, they do no harm when prudently conducted; yet, they are not to be relied on when the patient has not advanced beyond the first two months of pregnancy.

I have thus enumerated all these remedies, because they may be successively employed in this affection. In fact, the same medicine may act on one female and have no effect on another. And it must be confessed that sometimes all will fail, and we can scarcely succeed in moderating the patient's sufferings. The change of medicine is, however, useful, either by really calming her distress in a measure, or by sustaining her spirits, not seeming to abandon her, but holding out the idea that each new remedy may effect some amelioration. In this way she gradually approaches towards term, or at least to a period of gestation when the symptoms often disappear of themselves.

B. *Surgical Treatment.*—But where the vomitings continue, notwithstanding all the rational measures resorted to, the woman absolutely throwing up everything she takes, and the privation from food has reduced her to such a state of emaciation as to endanger life, and the symptoms which we have described as belonging to the second and third stages appear, some accoucheurs have advised (if her term is still remote) the production of premature labor. This operation has already been practised, in similar cases, by several English and German accoucheurs, with full success, both for the mother and child.

It seems to me that it cannot be improper to resort to this measure after the seventh month of gestation, for it then appears to be fully justified both by the dangers to which the mother is exposed, and by the possibility of the child living after its expulsion.

But is the case the same before the sixth month, when the sudden termination of pregnancy must necessarily lead to the death of the fœtus. This is one of the gravest questions which can come up in practice. Although fully disposed to sacrifice the child whenever that sacrifice will *surely* save the life of the mother, as in cases of extreme narrowing of the pelvis, I make no hesitation in declaring myself against the production of abortion under the circumstances in question.

I shall proceed to justify this proscription:—

1. When a woman having a contracted pelvis presents herself to a physician, he knows very well that if the pregnancy be allowed to go on until

term, he will have to choose between embryotomy and the Cæsarean operation; also, that in some cases the latter operation will be the only resource. If, after mature consideration of the inevitable consequences of the one and the probable consequences of the other, he decides upon the mutilation of the child, it will doubtless appear to him reasonable not to wait until the increased size of the fœtus at term shall add to the difficulties and dangers of embryotomy; therefore, the production of abortion within the first four months of gestation will seem to be fully justifiable.

But the conditions are different when the life of the mother is compromised by vomiting, however severe it may be.

In the first case, the danger is inevitable; and, unless abortion occurs spontaneously, the Cæsarean operation is the only resource, and we are aware of the usual consequence of the latter. But however intense the vomitings may be, and notwithstanding the state of exhaustion to which they reduce the female, still they are not inevitably fatal. Patients, whose condition justly excited the greatest solicitude, have been known to resist until the latter months and even until the term of their pregnancy, and then give birth to strong and healthy children. Others, whom the vomiting had reduced to a hopeless condition, have been suddenly restored to the most complete health. A case of this kind has fallen under my own notice, and the following was related to me (June, 1849) by M. P. Dubois.

A young German lady, two months and a half pregnant, had been troubled with the most obstinate vomiting from the first two weeks after conception. For the last six weeks especially she vomited almost without intermission; the smallest spoonful of fluid exciting violent contractions of the stomach. She was extremely emaciated and feeble, and her breath was disgustingly fetid; in short, her symptoms were so serious that M. Dubois, who was called in consultation, requested the additional advice of M. Chomel. Both these gentlemen came to a most unfavorable prognosis, and left the patient, under the impression that she had but a few days to live. Some cold applications were the only remedies advised; but the attending physician, being alarmed at her extreme weakness, limited them to slight aspersions. On the second day after the consultation the patient was attacked with violent purging, and from that time the vomiting ceased and never returned. The poor sufferer was at once able to take and retain some nourishment, which, being gradually increased in amount, soon restored her strength. Now, this woman, who had been so greatly reduced that two eminent men regarded her fate as sealed, is in the enjoyment of perfect health, and has almost reached the middle of her pregnancy with every prospect of a happy termination.

In two other cases, which the professor related with commendable frankness, he had deemed it his duty to propose the induction of premature labor. The women declined submitting to the operation, and reached the end of their pregnancies in good health.

2. When abortion is produced in cases of extreme contraction of the pelvis, there is a certainty that, when once accomplished, all the dangers which threatened the termination of the pregnancy are at an end, and that only the usual consequences of miscarriages can follow from the operation.

Even supposing that the artificial means should add to the ordinary risks of spontaneous abortions, the object is nevertheless certainly attained in terminating a pregnancy whose progress so greatly endangered the mother's life.

The conditions are very different in cases of spontaneous vomiting, for if all the instances on record be referred to, it will be found that the operation is far from removing the danger. I am well aware that four or five fortunate cases have been cited from the practice of English accoucheurs, but we are not told how often it has been followed by death.

Are the circumstances the same in cases of obstinate vomiting? If unsuccessful, the operation was performed too late, say they, when the prolonged defective nutrition of the mother had exhausted the vital powers; and had the uterus been emptied sooner, the chances of success had certainly been greater.

I believe this fully; but here it is that the most difficult question arises. When is the operation proper? If you act too soon, may it not be said, whilst instancing the cases of spontaneous cessation of the vomiting, as in those which have been quoted, that you have destroyed the fœtus without advantage? If you act too late, may you not be equally reproached, in view of the failure of all known operations, with an attempt which may have hastened the fatal termination?

Where will the prudent practitioner place the limit of expectancy? If it be remembered that the ancient accoucheurs declared, as do Mauriceau and Delamotte, that the vomitings may possibly produce abortion, yet are not dangerous for the mother; also that many moderns assert, with Burns and Desormeaux, that they have never known them to terminate fatally, there would certainly be small temptation to operate before all hope has been dissipated by the gravity of the symptoms. Our hopes, indeed! But does not nature sometimes mock at our expectations? Did not the patient of MM. Dubois and Chomel seem doomed to certain death?

I know it may be answered that it must be left to the tact and skill of the practitioner to think deeply, and choose conscientiously between the dangers of expectation and the chances of an operation; that the difficulties which I raise, present in a host of surgical cases; that there is barely an amputation which may not be authorized by affirming, *dogmatically*, that a spontaneous cure is impossible; that the exceptional preservation of a limb proves nothing against the propriety of amputation in a majority of similar cases.

All this is doubtless true; but let us not decide too quickly, for the comparison is far from being strictly just.

When the surgeon has to deal with a serious traumatic lesion, he regards nothing but the interest of his patient; and after explaining to him the grounds of his conclusion, may, in cases of difficulty, consult his wishes, and then leave his life at his own disposal. The accoucheur has the serious interest of two beings to care for; and though the instinct of self-preservation may silence in the female the voice of maternal feeling, it is nevertheless his duty to protect the fœtus, with whose welfare he is equally intrusted.

In a given traumatic lesion, all experience shows that spontaneous recovery is a rare exception. On the other hand, the experience of all accoucheurs goes to prove that the spontaneous cessation of vomiting is of almost universal occurrence.

We thus see that the surgeon and the accoucheur stand on a different footing, and that the difficulty which I have suggested is not removed by the comparison which has been made between them with that object.

[We shall proceed no further with this discussion, but first of all examine the facts. Experience having shown that abortion and spontaneous labor were, in cases of obstinate vomiting, often followed by recovery, it was naturally asked by physicians whether the process adopted by nature might not properly be effected by art. Some trials having been made here and there, M. Dénieux succeeded in collecting 32 of them, which he quotes in his thesis, giving as a result 21 recoveries and 11 deaths. Of the 21 successful cases, 15 were abortions, and 6 premature labors. To these we would add a case of our own, in which the vomiting being severe, and death imminent, it was decided, in consultation with Drs. Millard and Charrier, that abortion should be produced. The operation was successful. It was a twin pregnancy of two months duration.

Our conclusion is, that procured abortion, as well as premature delivery, is a valuable resource in intractable vomiting. It is nevertheless true that it has the great disadvantage of certainly sacrificing the life of the child; therefore, before undertaking the operation, the conviction derived from mature consideration that no other course remains by which the mother's life can be saved, should be sustained by the concurrence of several medical friends in consultation.

It is, in fact, more difficult under these circumstances than in a case of extreme contraction of the pelvis to determine the propriety of producing abortion, and that, too, without having the same certainty of saving the patient. We shall not revert to the comparison of such cases, already made on page 474.

Another difficult question remains to be settled: At what time ought abortion to be effected? In reply, we can do no better than quote the opinion of P. Dubois. "The production of abortion in the third stage of the disease is liable to the grave objection of not saving the patients, but of hastening their end and compromising our art. If done in the first stage, there would be the not less serious error of sacrificing a pregnancy which might, perhaps, have progressed happily to its term. Therefore, we conclude that the operation is applicable to the period intermediate to those mentioned." We would here call to mind that this second period is characterized: 1, by almost incessant vomiting, produced by all kinds of food, and sometimes, also, by the least quantity of pure water; 2, by debility so great as to keep the patient at rest, and occasionally by syncope; 3, continued fever; 4, in certain cases by a fetid and even putrid breath. When to these symptoms is added the failure of all the medication which has been tried, it is right to advise abortion, leaving with the family the responsibility of deciding upon it as a last resort.

Different operative procedures may be employed, the comparative value of which will come under discussion hereafter. (See *Operations*.)]

§ 4. Constipation. Diarrhœa.

Constipation is a very common affection in pregnant women, and it is usually attributed to the pressure of the developed uterus on the upper part of the rectum, by which not only the calibre is diminished, but its action is also paralyzed. Would it not be more reasonable to attribute it in many cases to a commencing chlorosis? We know, indeed, that constipation is so common in the latter disease that Hamilton regarded it as one of its causes.

Some authors attribute it to diminished secretion of bile. When carried too far it often produces anorexia, and disordered digestion, and becomes a cause of agitation and loss of sleep. Whatever be its cause, the strainings necessary to expel the hardened fæces that have accumulated in the intestine, may give rise to hemorrhage and abortion.

The best measures for preventing and remedying this state are nearly identical with those used at other periods of life.

The same remarks apply to the diarrhœa with which women are often tormented.

[Constipation, as just said, is very common during pregnancy. Diarrhœa sometimes occurs, and that more frequently than seems to be generally suspected.

The diarrhœa of pregnancy varies in character, and is due to different causes. Sometimes it alternates with the constipation which gives rise to it, and which is relieved thereby. At other times it coincides so nearly with conception as to be its first symptom; again, it may appear only during the last days of gestation, and indicate the imminence of labor. In none of these forms does it present any gravity, and is amenable to the treatment usually employed in such cases.

Exceptionally, however, severe diarrhœa may supervene during pregnancy, without any assignable cause. The passages are profuse and frequent, and accompanied with tenesmus; emaciation takes place with exhaustion of strength, the mouth becomes dry, and fever sets in.

Some of these cases resist all kinds of treatment, and may lead to abortion or premature labor. This form, to which the term intractable might well be applied, may prove fatal to the mother either before or after delivery. One case of the kind has come under our own observation.]

ARTICLE II.

LESIONS OF RESPIRATION.

Cough and dyspnœa are about the only affections claiming our examination under this title.

The dyspnœa that supervenes towards the end of pregnancy is evidently produced by the crowding of the lungs from the excessive uterine development, and the delivery alone can cure it; but sometimes it is sooner manifested in consequence of a pulmonary congestion, which must be remedied by general blood-letting, a light regimen, repose in a suitable position, and loose clothing.

The same may be said of such palpitations as are not due to organic disease which existed before the pregnancy; but it must not be forgotten that, though bleeding is useful when the dyspnœa or palpitations are very severe, by diminishing the local congestion for the time, the latter is much more frequently due to hydræmia than to a true plethora, and that the best means for preventing its return is to follow the bleeding by tonic remedies. (See the following article.)

As to the cough, it is only dangerous as regards the pregnancy, by the violent jars sometimes given, which may produce an abortion. Indeed, all observers who have written on influenza have carefully noted the frequency of this accident in women who were affected with it.

When the cough is the effect of pregnancy, it may sometimes be attributed to local plethora, and then we should bleed. But at other times it has a spasmodic character resembling whooping-cough, with the exception of the alteration of the voice. In such cases, I have derived much advantage from baths, repeated for several days in succession.

When it is the symptom of a chronic malady, existing prior to gestation, the treatment will vary with the disease that produced the cough. Whatever may be its origin, the accoucheur should always resort to such demulcents and pectorals as are calculated to diminish its intensity.

ARTICLE III.

LESIONS OF THE CIRCULATION.

§ 1. ALTERATIONS OF THE BLOOD. PLETHORA AND HYDRÆMIA.

The general circulation is more active in pregnant women than in others (see page 157), and this increased activity manifests itself by a greater frequency of pulse, which is often harder and fuller than in the non-gravid state. Though all this may be regarded as normal, it sometimes becomes exaggerated and gives rise to a slightly morbid condition. Thus, some women experience, at the same time, vertigo, dimness of vision, ringing of the ears, sudden flushings of the face, spontaneous heats over the body, but more especially of the head. If bleeding be practised under these circumstances, the blood will sometimes afford a large and consistent clot with but little serum; though much more frequently there is much serum, and a small clot, covered with a distinct whitish coat, resembling that observed in inflammatory diseases. (See page 160.)

The differences in the appearance of the blood drawn by venesection ought to have excited the suspicion that, notwithstanding their identity, these functional disturbances might be produced by different causes; and although some scattering therapeutic measures induce the supposition that the idea had suggested itself to some good minds, it is also evident that it was almost immediately stifled; for the majority of authors, even the most recent, do not hesitate to refer them to plethora, and making the treatment correspond with the etiology, recommend blood-letting as the best means of overcoming it.

The little advantage which I had derived from this practice had, for several years, excited doubts in my mind as to the value of the theory; which doubts were especially increased by reading the admirable investigations by M. Andral on the blood. Therefore, in treating, in 1844, in the second edition of this work, of the plethora of pregnant females, I wrote as follows: "After having read the curious statements just given (*analysis of the blood by M. Andral*), the reader will perhaps find them to disagree with the title of this paragraph, and possibly also with the therapeutic measures hereafter recommended; for how, indeed, can we reconcile this denomination of plethora, applied to the totality of the phenomena observed in most gravid females, with the evidences of anæmia furnished by the analysis of the blood? *Is it not probable that the profession has heretofore been in error*, in attributing to this cause what in fact is only due to an impoverishment of

This book is the property of
COOPER MEDICAL COLLEGE,
SAN FRANCISCO, CAL.
and is not to be removed
Library Room by any

the blood? Because, if to these results we add the beating of the carotids, the caprices of the stomach, the digestive disorders, and the varied nervous phenomena that occur during pregnancy, and which closely resemble those so often observed in chlorotic patients, are we not *irresistibly* brought to the conclusion, that the chlorosis which produces them in the one case also does in the other? and, consequently, that the bleeding generally recommended is more likely to augment than to diminish such disorders? A sufficient number of facts are still wanting to decide the question satisfactorily; but, while presenting in this work the views most generally received, we cannot conceal the effects produced on our mind by the experiments of Andral and Gavarret."

From that time we have endeavored to test by facts the inferences which we had drawn from the documents furnished by the experiments of these two learned professors; and we have to say, that the theory is confirmed by practice. Therefore we now assert boldly, what we before expressed timidly in a simple note: *That hydræmia is the most frequent cause of those functional disorders of pregnant women which have hitherto been attributed to plethora.*

However strange this proposition may at first appear, it seems to us to be proved by the results of the chemical analysis of the blood, by the symptoms presented by the patients, and by the happy effects of a tonic treatment.

It is now well proved that the essential character of plethora is based upon a great increase in the proportion of the blood corpuscles, as their diminution is the distinctive fact in anæmia. And it is well known that diminution of the corpuscles and increased proportion of water are the essential characteristics of anæmia and chlorosis. Now we have shown (pp. 157 and 159) whilst describing the changes in the blood during pregnancy, that the amount of corpuscles diminishes, whilst that of water increases. In this respect, therefore, pregnant women may be strictly compared with those affected with chlorosis. The increase of fibrin and diminution of albumen also observed during gestation (see pages 157 to 159), are of more difficult explanation.

The deficient nutrition of the mother, who is obliged, whatever may happen, to supply the fœtus with the food required for its development, may also explain the excess of fibrin, and in addition, the decrease of the corpuscles; for the experiments of M. Andral have shown that the blood of dogs, subjected to certain degrees of abstinence, presented the characters of chloro-anæmia, and coincided with a marked increase of the fibrin. Again, if we admit, with some modern chemists, that the fibrin is formed at the expense of the albumen of the blood, may we not find in the considerable diminution of the latter the cause of the increase of the former?

Finally, we would add that MM. Becquerel and Rodier, the only observers whose analyses give the proportion of iron in the blood of pregnant women, have shown that it is below the physiological average. Thus, in 1000 grammes of the calcined blood of a healthy and non-pregnant woman, the average proportion of iron is 0·541; in that of the pregnant female it is 0·449; and in well-marked chlorosis it is 0·366. The proportion of iron ollows, therefore, that of the corpuscles, and the expression of its amount uring pregnancy will serve to indicate the transition from the healthy ondition to confirmed chlorosis.

From all that has been said, we think it may be concluded that the prin- al elements of the blood undergo alterations during pregnancy analogous hose of chlorosis. These changes are doubtless in many cases purely siological, as we have already stated (see page 159), but may so increase become pathological by the establishment of hydræmia and chloro- nia.

e view which we take will become still clearer when we shall have d the following proposition.

e *Functional Disorders of Pregnancy hitherto attributed to Plethora are of Chlorosis.* Most of the authors who have written upon the func- l disorders of pregnancy have attributed them to plethora, on account e peculiar physiognomy which they present. Thus, because in many nant females they observed fulness and hardness of the pulse, a feeling eaviness in the head with somnolence, vertigo, ringing in the ears, hes of heat, sudden flushings of the face, &c., they regarded them un- itatingly as the expression of encephalic congestions, themselves the con- quence of general plethora.

Now it is really only necessary to read the list of symptoms belonging to hlorosis, in order to be convinced that they are identical for the two ffections.

This is easily explained, says M. Andral, by observing that if the mere assage of too great an amount of corpuscles through the vessels of the brain ppears to account sufficiently for the cerebral disorders witnessed in ple- ora, it follows that too small an amount of corpuscles traversing the same ssels will produce similar disorders; so that too great or too small an ount of corpuscles deranges certain actions of the brain in the same nner. Therefore, the true cause of the symptoms is not to be judged of their external characters, but only by the changes in the blood. Now, analysis of the blood of a large number of females, who complained of se supposed plethoric phenomena, has shown a marked diminution of puscles and an increase of serum.

Besides, if we remember what has already been said concerning the hology of pregnancy, it will be found that there is hardly one of the ctional disorders yet studied, which is not also observed in chlorotic men. What is more common than to find in chloro-anæmic patients the nt of appetite, disgust for food, whimsical and depraved tastes, cramps l pains in the stomach, nausea and vomiting,—in short, all those symp- ns of gastralgia which render many pregnancies so suffering? Are not o the headaches, toothaches, faintings, and the facial, frontal, orbital, or poral neuralgias, common, so to speak, to the two conditions? As re- ds the circulation, do we not observe the same modifications in the ngth of the impulse, the rhythm, and the clearness of the pulsations of heart, and is not a bellows murmur also heard in the principal vascular nks?

ome of these various disorders, such as the nervous phenomena, are more particularly observed in the first half of pregnancy; others, such as the pretended symptoms of plethora, trouble more especially those females who have reached a more advanced period. It must, however, be confessed, that sometimes all of them appear at the beginning, and sometimes at the end of gestation, which fact some persons have thought to militate against my theory. Why, said M. Jacquemier, should the same symptoms, which are regarded as disorders due to sympathy with the uterus, if they appear during the first half of pregnancy, be considered as caused by chlorosis, if they appear during the second half? Is there not something arbitrary and artificial in this,—something which seems to have been devised expressly for the support of a theory?

In the first place, I would observe that I have only spoken of the uncomfortable sensations which women experience in the latter months; but in supposing the similarity of the symptoms, there is nothing irrational in attributing to them a different origin. I may be allowed to recall what takes place in the case of a young girl becoming chlorotic: it will be seen that the succession of phenomena is absolutely the same as what I have supposed for the chlorosis of pregnant women. A healthy young girl reaches the age of puberty, when, under the influence of causes which we often cannot appreciate, the menstruation fails to become established, or takes place only in an imperfect or irregular manner. The uterus, being disturbed in the exercise of its monthly functions, soon reacts upon all the other organs. The appetite diminishes, the stomach becomes capricious, the tastes whimsical, the digestion painful; and from the persistence of this difficult digestion results incomplete assimilation, and soon deficient nutrition. After the lapse of a few weeks or months, the defective nutrition produces an alteration in the composition of the blood, which, when carried to a certain degree, produces all the symptoms of chlorosis,—symptoms bearing a strong resemblance to those which preceded and caused the general disease of which they are the expression.

No one, certainly, will deny the truth of the picture just drawn. Now, is not the same succession of phenomena witnessed in pregnancy? In both cases, is it not the irritation of the uterus produced by the new functions, which first reacts upon the other functions of the economy, disturbing their regular fulfilment, which afterward interferes with the assimilation of nutritive matters, and which finally produces chlorosis? Is not the latter condition indicated in the pregnant woman, as in the young girl, by the same symptoms? Where then is the difference? And if it be allowed that the primary functional disorders of the young girl are purely sympathetic, whilst those which occur later are attributable to chlorosis, why should we refuse to acknowledge the same as occurring during pregnancy?

After thus recalling the fact, that all the functional disorders of chlorosis are sometimes observed during pregnancy, it truly becomes a matter of astonishment that the resemblance between the two should not have been noted earlier, and that it should have been left for recent analyses to excite the suspicion that the same symptoms might be due to the same cause.

The pathological anatomy and symptomatology being then in accordance with each other, it remains to be seen whether the treatment will afford another evidence of the nature of the disorder.

Plethora was formerly considered so common, and so exclusively the cause of the diseases of pregnancy, that blood-letting had become a general practice. So strongly impressed were many women with the idea of the necessity of bleeding, that they thought themselves under an obligation to have recourse to it by the time they had reached the fifth month of gestation, and even demanded it before consulting their physician. Most practitioners declined performing these so-called preventive bleedings, though all regarded venesection as the best means of overcoming *plethora*, that is to say, the assemblage of phenomena attributed thereto. If the latter proposition were true, it would constitute an unanswerable objection to the theory we are endeavoring to establish. Fortunately, however, such is not the case.

I certainly do not wish to deny the amelioration produced by bleeding in certain cases; but it proves nothing against the poverty of the blood, and the chloro-anæmia. The lessened proportion of the corpuscles does not necessarily involve a diminution of the entire mass of the blood, as the word *anæmia* applied to this alteration would seem to indicate. Generally, on the contrary, the amount of this fluid remains the same, and sometimes even is considerably increased; thus corresponding with what M. Beau states to be habitually the case in chlorosis. A true plethora, which might be styled *serous*, then exists, in which case, especially to the usual signs of anæmia, are superadded headache, vertigo, ringing in the ears, etc.; and under these circumstances, bleeding may afford relief by diminishing the amount of blood. The same result is obtained in ordinary chlorosis, when bleeding is practised for the removal of local congestions. But, in pregnancy as in chlorosis, this alleviation is but temporary, and if the proportion of corpuscles be not brought up to the healthy standard by proper hygienic and therapeutic measures, the same symptoms will soon reappear, and with greater intensity. The abstraction of blood is, therefore, in any case, but a palliatory measure, only to be employed in extreme cases, when the general symptoms are very severe, but which might have been avoided by administering tonics and ferruginous preparations at an earlier period.

An animal diet, and preparations of iron, have, for six years back, always appeared to me to be quite as useful against the functional disorders of pregnancy as against those of chlorosis. Unless they be very serious, I no longer bleed for palpitations, pains in the head, or suffocations, nor have I known them, in a single instance, to resist the use of the preparations of iron longer than a couple of weeks. Even when the gravity of the accidents has obliged me to bleed to the extent of six or eight ounces at the utmost, I begin immediately with the use of iron, and it is very rarely that I am obliged as formerly to recur to venesection. Hemorrhage from the bowels might, in some cases, remove the necessity for phlebotomy, and M. Blot was certainly right in advising gentle purgatives under these circumstances.

There is still another condition, in which I have associated iron and bleeding with advantage; with what propriety we shall next see.

The excess of impoverished blood in pregnancy may, as in chlorosis, give ise to local congestion, which congestion, when carried beyond certain mits, explains the occurrence of epistaxis, and the less frequent hæmoptysis and hæmatemesis, all which seem to be the result of an effort on the part of nature to diminish the vascular fulness. These accidents are unusual during pregnancy, or, at least, rarely occur to an alarming extent. The reason seems to be, that from the moment of conception until delivery, all the vital powers appear to be concentrated upon a single organ, which forms a centre of fluxion, towards which all the troubles of the organism converge; this organ is the uterus. The congestion, which in the chlorotic patient occurs in the head or the chest, here takes place in the womb; and the extraordinary development of the vessels of the uterus, and their more or less intimate connection with those of the fœtus, sufficiently explain the danger of an over-determination of fluid. At a very early period, the congestion may occasion the rupture of one of the numerous capillary vessels distributed upon the internal surface of the mucous membrane (parietal or epichorial decidua); rather later, the congestion may be great enough to rupture one of the utero-placental vessels, and in both cases give rise to an effusion, which, by destroying wholly or in part the utero-placental relations, proves fatal to the child.

These uterine congestions, which are properly considered, in some cases, as the consequence of *general plethora*, I have witnessed much oftener in feeble and anæmic women. They almost always appear at the menstrual periods, as though the monthly periodicity excited at those times a more active vitality in the uterus. The woman complains of tension, of swelling of the abdomen, of a feeling of weight in the pelvis, the groins, and upper part of the thighs; she also soon suffers pain in the region of the kidneys and in the loins. If the proper measures are not employed, the vascular congestion, and the pressure upon the uterine walls resulting from it, irritate the organ; slight contractions occur, sometimes even a little blood flows from the vulva, and announces a threatened abortion. These symptoms are almost always accompanied with marked vesical tenesmus. Can the latter be due to pressure on the neck of the bladder, produced by an increase in the size and weight of the uterus caused by the congestion?

It is evident that when these symptoms of uterine congestion appear, prudence dictates a recourse to all the means likely to effect a revulsion. Thus, sinapisms to the upper and posterior part of the back, seven or eight dry cups to the upper part of the chest, and finally, if these measures are insufficient, bleeding, to the extent of six or eight ounces, as a powerful revulsive, is very useful. But, even here, the bleeding may have only a momentary effect by destroying the local plethora, and by no means enables us to dispense with medicines capable of modifying the state of the blood. We shall return to this subject under the head of *Preventive Treatment of Abortion.* It is proper, however, that I should say in this place, that many of my patients who had suffered frequent miscarriages, have been enabled to attain their full period by the use of iron administered from the beginning of pregnancy.

We see, therefore, and I call the attention of practitioners to this point, that if the medicament which cures a disease sometimes also proves its nature, then the disorders which we have described are oftenest due to chloro-anæmia, and not to plethora. The latter proposition, confirmed as it is by pathological anatomy and symptomatology, I hold to be incontestable.

I say oftenest, for I would not have my assertion regarded as absolute. Though true plethora, that which is distinguished from serous plethora by an increase in the amount of the corpuscles, be rare, it nevertheless is sometimes met with, especially at a very early stage of gestation. Females of a really plethoric constitution, whose menstrual discharge is habitually abundant and high-colored, may retain this constitutional peculiarity during pregnancy, and sometimes even have it increased. The sixty odd analyses which we have quoted, show that, in several instances, the proportion of corpuscles underwent no diminution in the earlier months, and that in the case of one woman who had reached the end of the second month, M. Andral found them increased to one hundred and forty-five. It is even probable that, when analyses shall be more numerous, the same peculiarity will be remarked in some cases of advanced pregnancy. For my own part, I have certainly met with females whose antecedents, symptomatic expression, and the physical properties of whose blood afforded every indication of plethora.

The fact of our having observed but few instances of the latter class, is explained by our practising in the metropolis, where all debilitating influences are collected. The hygienic conditions in which women live in the country, dispose them less to chlorosis, and it is exceedingly probable that their blood is not so much altered during pregnancy as in the cases we have noticed. To this, I think, is certainly due their exemption from the functional disorders, nervous or otherwise, which so commonly affect the females of large cities. This is an additional argument in favor of my theory.

Though such women are exposed to the general consequences of plethora, they present more frequently the signs of local or uterine plethora, especially during the first half of pregnancy, at the periodic returns of the menstrual periods. The local phenomena, as tension, swelling of the abdomen, feeling of weight in the pelvis, are very strongly marked in their cases. The circulation of the fœtus also, sometimes, appears to share in the troubles of the maternal circulation, for these signs of congestion are frequently observed to be followed by the weakening, diminished frequency, and even complete cessation of its active motions; and if the motions have not yet been perceived, the plethoric condition may greatly retard their appearance. However difficult the explanation of these peculiarities may appear, they are too common to be doubted. The best proof that can be given of the effect of this local congestion upon the motions of the child, is their prompt reappearance after a venesection made at the proper time; and it very frequently happens that a woman who is five months, or five months and a half, gone, without having felt them, perceives them suddenly after bleeding.

It is unnecessary to state that here blood-letting constitutes the proper treatment, and that the quantity abstracted may be regulated by the circumstances of the individual cases. It is, however, better to practise several small bleedings at short intervals, than to depend upon a single copious one. The production of syncope should be studiously avoided.

We shall have occasion, when treating of abortion, to finish the stud of the therapeutical indications. (See *Abortion.*)

To recapitulate, the functional disorders of pregnancy, as cephalalgi giddiness, vertigo, ringing in the ears, dyspnœa, palpitations, &c., are rarel due to true plethora, but most generally to chloro-anæmia. We mig indeed distinguish for pregnant women a very rare *sanguineous plethor* and a very common serous plethora.

Independently of this marked diminution of globules and albumen, th blood is sometimes considerably altered by admixture with the elements o the urine. This alteration, which has been described of late by the Ge mans under the title of *uræmia*, and of which we shall soon have occasio to speak, is a capital fact in the etiology of several diseases which are liabl to appear in the puerperal condition. We merely state the fact for th present, leaving further notice of it until we come to treat of the lesions o the urinary secretion.

§ 2. HEMORRHAGE.

[Hemorrhage from the genital organs is, unfortunately, but too common durin pregnancy, and is an accident much to be apprehended. The hemorrhage ma assume very different features according to the cause which produces it and th time of its appearance. On this account it would be so difficult to treat of it in single chapter, that its history must necessarily be divided into several article which we think it best thus to indicate at the outset. Sometimes the effusion o blood is confined to the placenta, and has already been described as placental ap plexy with the other diseases of the placenta (see *Diseases of the Ovum*). Uterin hemorrhage occurring during the first six months of gestation should, if it be some what profuse, excite fears of abortion, which it often gives rise to or accompanie Under these circumstances it is impossible to separate the study of the hemorrhag from that of the abortion. (See *Abortion*).

Hemorrhage occurring during the three last months of gestation presents, on th other hand, the same symptoms, and requires the same treatment as though i occurred during labor. One description, therefore, suffices for both, and will b given in connection with the history of other accidents which are liable to occu during labor. (See *Dystocia*, article HEMORRHAGE.)

Again, rupture of varicose veins of the vulva and vagina gives rise to effusio of blood in these organs. Such an effusion is known as a *thrombus*. As it rarel occurs except during labor, we refer the account of it also to the article on Dystoci (See *Dystocia*, article THROMBUS.)

We shall merely refer in this place to a rather rare and curious form of uterin hemorrhage. Some women have a discharge of blood from the vulva a few day after conception. It is small in amount and is sometimes intermittent and some times continuous; it is rarely attended with clots, but resembles a moderate men strual flow. It sometimes lasts for three or four months without interruption, ye neither gives rise to serious symptoms nor interferes with the course of gestatio finally it ceases without assignable cause. In our opinion, the discharge has it source in the neck of the uterus, which, in these cases, has appeared to us bot large and softened. The explanation would at least seem probable, when w remember how readily blood exudes from the os tincæ when a pregnant woman i examined by means of a speculum. An ulceration of the cervix would facilitat the discharge of blood. It requires no treatment, the greatest danger being tha it might lead to the belief of the non-existence of pregnancy.]

§ 3. VARICES. HEMORRHOIDS.

A varicose condition of the veins in the lower extremities, the vagina, d inferior parts of the rectum, is quite a common occurrence towards the tter part of gestation, though, as regards treatment, the varicose veins in e limbs only require the usual precautions to prevent their rupture. For is, methodical compression is the best remedy, and every attempt at a dical cure should be discountenanced.

[Varicose veins of the limbs sometimes burst during pregnancy, and the result- ng hemorrhage is almost always serious in consequence of the pressure of the terus on the iliac veins. Though some cases are said to have proved fatal, any emorrhage of this kind is generally easily arrested by well-regulated pressure pplied to the seat of the injury.

The veins of the vulva, always dilated during pregnancy, sometimes become aricose, giving the sensation of well-defined cords. No annoyance usually results, hough some women complain of a very uncomfortable feeling of weight whilst tanding. Moderate pressure by means of a T bandage almost always affords relief.

Rupture of one of these varicose veins may give rise to severe hemorrhage or ven death, as in the following case which came under our notice at the hospital f the Clinique. A pregnant woman, in other respects in good health, was affected ith varicose veins of the vulva. One evening, whilst about retiring, she attempted, hilst sporting with some of the other women in the dormitory, to leap from her ed. Falling backward, she found herself seated upon a chair, the edge of which ad struck against the vulva. A hemorrhage so severe as to prove fatal in a short ime, was the immediate result. At the autopsy, the only lesion that I could dis- over was a contused wound about half an inch in length upon the external surface f the left internal labium. Water injected into the primitive iliac vein escaped apidly from the little wound just mentioned. Had the cause of the hemorrhage een discovered as soon as the accident occurred, the effusion could have been cer- ainly stopped by pressure directly applied.

As the rupture of the veins of the vagina and vulva occurs most frequently dur- ng labor, we refer for further particulars to the subject of *Thrombus*. (See *Dys- ocia.*)]

Hemorrhoids, like varices, are an ordinary consequence of the uterine ressure on the hypogastric vessels; but they may likewise be frequently roduced by constipation, and the attendant accumulation of hard matters n the rectum. The bleeding piles are generally less disastrous; but the thers are more grave and very painful. In fact, it often happens that omen affected with them can neither stand nor walk, and they are even roubled when seated.

The first indication is to combat the costiveness, and then to assuage the ain by tepid bathing, cataplasms, and emollient and narcotic lotions, or he poplar ointment may be applied to the tumors; and where they are in- ernal, a suppository of cocoa-butter might be introduced into the rectum. iniments containing opium and belladonna will frequently relieve the atients; but this is all that we could prudently do under the circum- tances.

When the inflammation and turgescence are very great, bleeding in the rm is advisable, as this is much preferable to the application of leeches in he immediate neighborhood of the tumor; true, the latter calms the pains temporarily, but then, in certain females, they might bring on an abortion. I have never known, says Desormeaux, the application of leeches on the tumors, or the incision of the latter, to procure any durable relief.

Where the irritation from the piles seems to react on the womb, and threatens a uterine hemorrhage, M. Gendrin has derived signal advantage from cold applications around the pelvis. In those cases, says he, if the hemorrhage is imminent, we augment the activity of the topical remedies placed directly over the parts affected, by using cold baths to the breech at the same time, the temperature of the water never having been lower than 12° or 15° (Centigrade, equivalent to 54° or 59° Fahr.). I have several times employed cold injections successfully. The plan is to take every evening a large cold enema, which after being discharged is followed by a small one, which ought to be retained.

We shall speak more fully of the varicose condition of the vaginal veins under the article *Thrombus of the Vulva.*

ARTICLE IV.

LESIONS OF THE SECRETIONS AND EXCRETIONS.

§ 1. Ptyalism.

Ptyalism, or a hypersecretion of saliva, sometimes occurs during pregnancy. It generally lasts but a short time, rarely more than two months. One case, however, is mentioned by M. Brachet, in which the salivation commenced in the second month, and lasted for a month after delivery and I have quite recently observed a similar instance in the case of the wife of one of my professional brethren. It frequently returns in several successive pregnancies. I have seen it continue between six and seven weeks in the two first pregnancies of a lady who has since had another child without a recurrence of the affection; and M. Danyau, Jr., mentions a patient who was profusely salivated for five months in her first pregnancy, and still longer and more profusely in two succeeding gestations.

However considerable the salivation may be, it is rather a disagreeable inconvenience than a serious complication. Though it has in no case materially affected the health, some women have been so annoyed with the continual spitting, and the flow of saliva which sometimes deluges the pillow at night, as to insist upon being relieved of it. Happily, in a large proportion of cases, the ptyalism ceases spontaneously, for no great confidence can be reposed in the measures generally resorted to for its removal. Some advantage, however, may be derived from the use of aromatic infusions and slightly astringent gargles. Like Desormeaux, I have found it useful to recommend the patients constantly to keep a little piece of sugar-candy in the mouth. Others, again, advise lumps of gum arabic, and pieces of ice. It is useful to be acquainted with these various measures, if only to keep up the patience of the sufferer, by varying them from time to time until the disorder ceases of its own accord.

Some authors seem to have dreaded the effect of the sudden suppression of a profuse salivation. Two cases are mentioned, in one of which apoplexy, and in the other symptoms of suffocation, appeared to result from it. I do not think that the relation of cause and effect has been satisfactorily shown in these cases, and am tempted to believe that here, as in many other instances, it has been erroneously concluded, *post hoc, ergo propter hoc.*

§ 2. EXCRETION OF THE URINE.

The renal secretion is rarely increased during pregnancy; those writers who have stated the contrary, having been deceived by the frequent inclinations to urinate which females experience at certain periods of pregnancy. These repeated desires are due to a true vesical tenesmus, produced by the compression exerted upon the body and neck of the bladder by the uterine tumor. They occur every hour, sometimes oftener, and are relieved by the discharge of a few drops of urine.

The pressure of the uterus upon the neck of the bladder is sometimes so great as to obstruct the emission of urine, and render it painful or even impossible. This difficulty in urinating may occur in the commencement of pregnancy, either when the pelvis is too large, and permits the uterus to remain a long time in the excavation, or on the occurrence of a prolapsus uteri, or those other displacements of this organ known as anteversion and retroversion.

Most frequently, however, it appears towards the end of gestation, either because the uterus, from being pushed down by the presenting part of the fœtal head, early engages in the excavation, or because the womb is forcibly carried forwards; in the latter case the body of the bladder is pressed upwards and in front by the uterus, and its neck forced against the superior margin of the symphysis pubis.

When the anteversion is well marked, the body of the bladder forms an angle of the neck; in some cases it is even lower, whence the introduction of a catheter is then exceedingly troublesome. After all, the difficulty of urinating still persists until term, whatever we may do; for we can only alleviate it by tepid bathing, the horizontal position, and more particularly by the use of a bandage to sustain the abdomen.

Where the retention is complete, the bladder, by becoming distended, may increase so much in size as to reach the umbilicus, and its excessive distention might produce an inflammation or even a rupture, especially during the throes of labor; but where the neck is not altogether obliterated by the pressure, an incontinence of urine may ensue, the fluid dribbling away drop by drop; though, unfortunately, that is not always the case, and the catheter must then be resorted to.

I have already said this operation is attended by difficulties under such circumstances, and when it is quite impossible to perform it, the distress may be relieved, in a measure, by pressing back the uterus from the symphysis pubis with the two fingers introduced into the vagina, and the woman should be taught to aid herself in this way.

In some instances, the female suffers at the latter stages a considerable smarting or pain in urinating, as sharp as if there was a stone in the bladder; these symptoms arise from a true catarrh of the body, or at least of the neck of this organ; the urine, in fact, often contains whitish flakes of purulent matter. Such symptoms require the general antiphlogistic treatment, local bathing, emollients, and mucilaginous drinks. As a general rule, women only suffer from an incontinence of urine during the last three months, and then the delivery is the only remedy; however, it shows itself in the early stages of gestation in certain females, being evidently produced by the pressure which the uterus, that is still within the pelvis, makes on the neck of the bladder, and it lasts until the womb rises above the superior strait. If the incontinence remains after the fifth month, the symptoms may be relieved by injections of warm water, and by the internal use of tonics.

Though the amount of urine is not changed, its composition sometimes undergoes alterations which it is important to be acquainted with.

I shall not return to the consideration of the peculiar pellicle called kyesteine by M. Nauche, and whose diagnostic value we have already determined; but I shall proceed to notice a very remarkable fact, which we shall often have occasion to refer to; I speak of the presence of albumen, which is found in greater or less amount in the urine of some women at an advanced stage of pregnancy. (See *Albuminuria.*)

§ 3. ALBUMINURIA. URÆMIA.

The credit of having called the attention of physicians to the presence of albumen in the urine of pregnant women belongs to M. Rayer, whose admirable and laborious investigations of the disease of the kidneys have thrown so much light upon the pathology of those organs. He was the first to endeavor, in his splendid work, to determine the effect of this alteration of the urinary secretion upon the health of the mother, and the regular development of the fœtus. Afterward, followed the observations of Dr. Lever and of Dr. Cahen, who, by the advice of his master, M. Rayer, published a good thesis upon the subject. Next came the interesting memoir of MM. Devilliers and Regnauld, and another thesis by M. Blot. More recently, two manuscript memoirs by MM. Imbert Goubeyre, and Bach, and the researches of Frerich, Schott, and Wieger, have shed some light upon this still obscure point of puerperal pathology.

It is known that albuminuria is generally the symptom of an organic disease of the kidneys, which almost always proves fatal; hence, it may be readily understood, that when this change in the urine is observed during pregnancy, it becomes at once desirable to ascertain whether it be necessarily due to the same cause, or whether it be merely one of the numerous modifications produced in the economy by gestation.

In the first case, it is a very serious affection, calculated to awaken all the solicitude of the physician; in the second, it is but a temporary functional disorder, which will most probably disappear with the cause that produced it. Unfortunately, in the present state of our knowledge, it is very difficult to decide the question. For, on the one hand, 1. The normal diminution of the albumen in the blood of pregnant women, which diminution is much greater in patients affected with albuminuria, since MM. Devilliers and Regnauld have observed it to descend to 56·39, would lead to the supposition that the cases under consideration were but exaggerations of what ordinarily occurs, and that the elimination of a larger amount of albumen than usual from the blood, be the cause what it may, accounts for its evacuation by the urine. 2. The albuminuria of pregnancy is not generally accompanied by the functional disorders and the symptoms to which it gives rise when connected with disease of the kidneys; and the dropsy itself, which is almost constantly observed in the latter case, is sometimes wanting in pregnant women affected with albuminuria, as was twice observed by MM. Regnauld and Devilliers, as I have myself witnessed, and as M. Blot found to be the case twenty-three times out of forty-one. 3. Lastly, in the majority of instances, it disappears immediately upon the termination of the pregnancy which caused it; and when we consider the obstinacy of albuminous nephritis, it is difficult to account for this sudden disappearance of a disease, which, under other circumstances than the puerperal condition, so frequently has a fatal termination. On the other hand, however, observation shows that in almost all the cases in which women die of the convulsions which too frequently complicate albuminuria, the kidneys present the anatomical characteristics of albuminous nephritis, the more or less advanced degrees of alteration appearing to correspond with the duration of the disease and the amount of albumen discharged. Many times have I had occasion to observe this fact, and fearing lest I should interpret the alterations erroneously, have almost uniformly presented the kidneys to the examination of M. Rayer, who generally recognized in them the second, sometimes the third, and only once the fourth degree of alteration.

The learned physician of La Charité considers the more frequent occurrence of the anatomo-pathological characters of the second degree of the disease to be due solely to the recency of the latter, and by no means to a difference of nature. It is no less the consequence of a renal hyperæmia, which he supposes may be caused in many cases by compression of the emulgent veins by the enlarged uterus, and the consequent obstruction to the return of the venous blood. That, in simple cases, it generally disappears promptly after delivery, is probably due to the consequent cessation of the congestion of the kidney which was maintained by the pregnancy.

We see, therefore, that the question is far from being settled; whilst M. Blot, for example, regards puerperal albuminuria as generally unconnected with Bright's disease, M. Bach, of Strasbourg (Memoir, crowned by the Academy), thinks that it is only *sometimes* due to albuminous nephritis, and M. Imbert Goubeyre (Memoir, crowned by the Academy) endeavors to prove that it is always a sign of Bright's disease. Now, is it impossible to throw a little light upon this question, which is still so obscure?

Healthy urine contains no albumen, and the same is true for the healthy woman in the puerperal condition. Albuminuria, therefore, always indicates a pathological condition of which it is the symptom; for every functional disorder, whether temporary or persistent, supposes a momentary or prolonged alteration of the organs whose office it is to accomplish the function. Therefore, the investigation of the causes of albuminuria implies that of the general or local affections which are capable of producing it. But lest we should go astray in these researches, it is very important to ascertain *a priori*, what are the organs upon which the accomplishment of the urinary secretion devolves. The kidney is supposed to be exclusively intrusted with this office, and thus it happens that the material explanation of all the disorders of the secretion is sought for in lesions of that organ. Now, as M. Pidoux has very judiciously observed, the secretion of urine is not confined to the kidney, since it takes place previous to the formation of the latter. (Uric acid and the other elements of the urine have been discovered in the fluid contained within the allantoid.) The process of assimilation, which is so active in the fœtus, can only be understood by supposing a contemporaneous process of decomposition. The blood which flows to the organ is already charged with the elements of urine which are to be separated from it in the passage. The function begins in all parts of the economy by this admixture of heterogeneous elements with the blood, and is completed in the kidney by their elimination from the circulating fluid, which is returned in a purified condition. M. Pidoux was therefore right in saying, that the secretion of urine is at once a local and general function: general, because it commences everywhere, and local, because it ends in the kidney. To study the latter organ exclusively, when we wish to obtain a physiological idea of the function, is to neglect an important element; so, also, in pathology, always to expect to find the cause of the disorders of the urinary secretion in alterations of the kidney, is to overlook a multitude of other causes which may have a corresponding influence. The elements of the blood conveyed by the renal artery exist, in health, in a fixed proportion, and certain of them are destined to be eliminated by the kidneys. Now it is easy to understand that if an alteration in the structure of these organs is capable of modifying both the quantity and quality of the matters eliminated, an alteration of the fluid, such, for example, as the diminution or increase of its solid or fluid parts, may also have the same effect. Clinical observation and post-mortem examination give constant support to this idea: for though we sometimes find a material lesion of the kidney to which we attribute the albuminuria, we are very frequently obliged to recognize the fact that it is very often absent.

[In the present state of knowledge in respect to albuminuria it cannot be regarded as the symptom of any one single lesion, the passage of albumen being due to many different causes upon the nature of which great light has been thrown by physiological experiment. The most striking experiment is that of Claude Bernard, who, having injected a solution of the white of an egg into the veins of an animal, found that albumen soon made its appearance in the urine. The same result followed the injection of serum of blood. Albuminuria may also be produced artificially by feeding animals with albuminous matters exclusively. All these experiments prove that an excess of albumen in the blood is always followed by albuminuria. A somewhat similar excess is found in the blood of pregnant women, for, we have here to consider not the relative proportions of the water and organic matters, but rather the comparative relations of the two. Now Mr. Gubler states that such a comparison shows, as a general rule, a marked predominance of albumen as compared with the corpuscles (see page 158). He therefore regards the proportionate superalbuminosis of the blood as the common determining cause of albuminuria. During pregnancy, continues this author, the mother's blood has to supply the fœtus with its nutritive materials, but only in a soluble and diffusible form, inasmuch as no inosculation exists between the maternal and fœtal vessels. Albumen in its various forms is, therefore, required for the nourishment of the new being, and whilst this is the case the maternal organism has to provide for a double expenditure.

t is by pathological anatomy and symptomatology, I hold to be incontestable.

I say oftenest, for I would not have my assertion regarded as absolute. Though true plethora, that which is distinguished from serous plethora by an increase in the amount of the corpuscles, be rare, it nevertheless is sometimes met with, especially at a very early stage of gestation. Females of a really plethoric constitution, whose menstrual discharge is habitually abundant and high-colored, may retain this constitutional peculiarity during pregnancy, and sometimes even have it increased. The sixty odd analyses which we have quoted, show that, in several instances, the proportion of corpuscles underwent no diminution in the earlier months, and that in the case of one woman who had reached the end of the second month, M. Andral found them increased to one hundred and forty-five. It is even probable that, when analyses shall be more numerous, the same peculiarity will be remarked in some cases of advanced pregnancy. For my own part, I have certainly met with females whose antecedents, symptomatic expression, and the physical properties of whose blood afforded every indication of plethora.

The fact of our having observed but few instances of the latter class, is explained by our practising in the metropolis, where all debilitating influences are collected. The hygienic conditions in which women live in the country, dispose them less to chlorosis, and it is exceedingly probable that their blood is not so much altered during pregnancy as in the cases we have noticed. To this, I think, is certainly due their exemption from the functional disorders, nervous or otherwise, which so commonly affect the females of large cities. This is an additional argument in favor of my theory.

Though such women are exposed to the general consequences of plethora, they present more frequently the signs of local or uterine plethora, especially during the first half of pregnancy, at the periodic returns of the menstrual periods. The local phenomena, as tension, swelling of the abdomen, feeling of weight in the pelvis, are very strongly marked in their cases. The circulation of the fœtus also, sometimes, appears to share in the troubles of the maternal circulation, for these signs of congestion are frequently observed to be followed by the weakening, diminished frequency, and even complete cessation of its active motions; and if the motions have not yet been perceived, the plethoric condition may greatly retard their appearance. However difficult the explanation of these peculiarities may appear, they are too common to be doubted. The best proof that can be given of the effect of this local congestion upon the motions of the child, is their prompt reappearance after a venesection made at the proper time; and it very frequently happens that a woman who is five months, or five months and a half, gone, without having felt them, perceives them suddenly fter bleeding.

It is unnecessary to state that here blood-letting constitutes the proper reatment, and that the quantity abstracted may be regulated by the cir-umstances of the individual cases. It is, however, better to practise veral small bleedings at short intervals, than to depend upon a single pious one. The production of syncope should be studiously avoided.

But this is not all. The kidney may also be the seat of the initial phenomena of the disease; which would then be due to a *primitive albuminous nephritis*.

To recapitulate: the albuminuria of pregnancy is produced by various causes, the principal of which, in our opinion, seem to proceed from and be connected with the three following conditions:

1. Superalbuminosis.
2. Over-distention of the blood-vessels of the kidneys.
3. Albuminous nephritis, which may be either primary or secondary.]

This succession of pathological phenomena seems to me to throw much light upon the etiology and nature of puerperal albuminuria, and to reconcile apparently contradictory facts and opinions. It were certainly going too far to say that all cases of albuminuria during pregnancy are attended with albuminous nephritis; it is an opposite exaggeration, on the other hand, to insist that there very rarely exists a connection between the albuminous urine and the disease described by Bright. The true statement, we think, would be: that pregnancy generally produces a notable change in the relative proportion of the elements of the blood, which change consists essentially in a diminution of the solid constituents, with relative predominance of albumen.

This general alteration is of itself capable of producing the elimination of albumen; but when existing in a slight degree only, and therefore unequal to the production of albuminuria, may have its action assisted by the active or passive congestions to which the kidney may be exposed during pregnancy, and especially during labor. Those simple hyperæmias of the kidney, which are so often seen after death, and which are really the first degree of granular nephritis, do not appear to have any other cause.

The marked influence which a first pregnancy appears to have in the production of albuminuria (the resistance of the walls of the abdomen increase greatly the pressure sustained by the parts situated behind the uterus) is thus explained, as also the rapidity with which the albumen frequently disappears after labor.

[According to most authors, the presence of albumen in the urine is almost always coincident with diminution of urea, which would even seem to lessen in quantity in proportion to the abundance of urine. The urea being imperfectly eliminated by the kidneys, therefore accumulates in the blood. For further discussion of this subject, see *Uræmia*, at the end of this article.

Let us now examine the methods of detecting the presence of albumen in the urine and the symptomatic troubles to which its existence there gives rise.

Notwithstanding all that has been said respecting the appearance of albuminous urine, its want of color, and the frothy bubbles which form on its surface, it would often pass undetected if care were not taken to examine it closely by peculiar processes. Many chemical reagents have been proposed for its analysis, but heat and nitric acid are almost the only ones to be relied on.

The simplest process for detecting albumen is as follows: having drawn the urine by a catheter in order to avoid the inconvenience of admixture with vaginal or lochial discharges, it should be poured into a tube and heated to the boiling-point. When ebullition commences, should the urine be albuminous, it grows cloudy, and a flocculent coagulum precipitates. It ought, however, to be understood that this coagulum is not a certain indication of albumen, since alkaline urine might precipitate its earthy salts. An opposite error might also occur, inasmuch as highly

§ 3. VARICES. HEMORRHOIDS.

A varicose condition of the veins in the lower extremities, the vagina, and inferior parts of the rectum, is quite a common occurrence towards the latter part of gestation, though, as regards treatment, the varicose veins in the limbs only require the usual precautions to prevent their rupture. For this, methodical compression is the best remedy, and every attempt at a radical cure should be discountenanced.

[Varicose veins of the limbs sometimes burst during pregnancy, and the resulting hemorrhage is almost always serious in consequence of the pressure of the uterus on the iliac veins. Though some cases are said to have proved fatal, any hemorrhage of this kind is generally easily arrested by well-regulated pressure applied to the seat of the injury.

The veins of the vulva, always dilated during pregnancy, sometimes become varicose, giving the sensation of well-defined cords. No annoyance usually results, though some women complain of a very uncomfortable feeling of weight whilst standing. Moderate pressure by means of a T bandage almost always affords relief.

Rupture of one of these varicose veins may give rise to severe hemorrhage or even death, as in the following case which came under our notice at the hospital of the Clinique. A pregnant woman, in other respects in good health, was affected with varicose veins of the vulva. One evening, whilst about retiring, she attempted, whilst sporting with some of the other women in the dormitory, to leap from her bed. Falling backward, she found herself seated upon a chair, the edge of which had struck against the vulva. A hemorrhage so severe as to prove fatal in a short time, was the immediate result. At the autopsy, the only lesion that I could discover was a contused wound about half an inch in length upon the external surface of the left internal labium. Water injected into the primitive iliac vein escaped rapidly from the little wound just mentioned. Had the cause of the hemorrhage been discovered as soon as the accident occurred, the effusion could have been certainly stopped by pressure directly applied.

As the rupture of the veins of the vagina and vulva occurs most frequently during labor, we refer for further particulars to the subject of *Thrombus*. (See *Dystocia*.)]

Hemorrhoids, like varices, are an ordinary consequence of the uterine pressure on the hypogastric vessels; but they may likewise be frequently produced by constipation, and the attendant accumulation of hard matters in the rectum. The bleeding piles are generally less disastrous; but the others are more grave and very painful. In fact, it often happens that women affected with them can neither stand nor walk, and they are even troubled when seated.

The first indication is to combat the costiveness, and then to assuage the ain by tepid bathing, cataplasms, and emollient and narcotic lotions, or he poplar ointment may be applied to the tumors; and where they are inrnal, a suppository of cocoa-butter might be introduced into the rectum. niments containing opium and belladonna will frequently relieve the tients; but this is all that we could prudently do under the circumnces.

When the inflammation and turgescence are very great, bleeding in the n is advisable, as this is much preferable to the application of leeches in immediate neighborhood of the tumor; true, the latter calms the pains

General infiltration is not so uniform an accompaniment of albuminuria as I thought formerly. In order to determine its relative frequency, it is necessary not only to examine the urine of infiltrated females, as was my practice, but to investigate carefully the urine of all pregnant women, as was done by M. Blot. It will then be discovered that many patients with albuminuria present not a trace of œdema. M. Blot found it, we have said, in 23 cases out of 41.

It is proper to observe, that this absence of infiltration is also often noticed in the ordinary Bright's disease. By a collection of observations with autopsies, derived from various authors, Frerich found that, of 220 cases of Bright's disease, 175 were accompanied with œdema, and 45 were free from it.

Nervous disorders are sometimes attendant upon the anasarca.

In the last edition of this work we stated that puerperal albuminuria did not usually give rise to the symptoms which accompany Bright's disease. This is true for the light cases, which, happily, are the most frequent; but science has progressed, and modern researches have proved that certain of the affections of the pregnant female, whose cause and nature were entirely unknown, coincide with albuminuria, and very probably are, like it, the consequence of extensive elimination of albumen from the blood. Thus, in several cases of amaurosis occurring during pregnancy, MM. Simpson, Imbert Goubeyre, and others, have detected albumen in the urine. The same is true of certain cases of obstinate headache, of lumbar pains and pleurodynia, of paralysis (hemiplegia or paraplegia), (Robert Johns, Simpson, Imbert Goubeyre), and of contractions, hemorrhages (Blot), &c. (See *Uræmia*, and *Paralysis*.)

Now, M. Imbert Goubeyre's remark is very important, namely, that all these phenomena are found in the symptomatology of Bright's disease, which confirms the comparison that we have made.

To the symptoms just mentioned we might add eclamptic convulsions, which are, happily, quite rare, and hardly ever appear, except at an advanced stage of the disease. We shall treat of them at length hereafter. (See *Uræmia*, and *Eclampsia.*)

It is very difficult, not to say impossible, to determine with certainty when the albuminuria commences; to do this, it would be necessary to examine daily the urine of a large number of women during the entire period of pregnancy. Hitherto, it has generally been observed only during the latter months. M. Bach, of Strasbourg, however, says that he has seen it at six weeks in a very nervous person. I once detected it at four months in a greatly infiltrated primiparous female, who was delivered at six months of a still-born child, and whose urine was slightly albuminous eighteen months afterwards, although the infiltration had disappeared since six months. M. Cahen mentions in his thesis three cases, recorded in the fifth and sixth months, and M. Bach two others. Perhaps, now that attention is directed to this point, such facts will multiply; but those observed hitherto have almost always been noticed in the latter stages. Sometimes it appears only at the moment of delivery, under the influence of the parturient efforts, which are well calculated to produce congestion of the kidneys.

When once begun, the progress of albuminuria is liable to great variation; sometimes it continues uninterruptedly until the commencement of labor, and increases during its continuance; at others, it varies greatly in intensity, and may even cease completely for several days, then reappear, and again stop at very indefinite intervals.

When it begins during labor or shortly before, it often disappears a few hours or days after delivery; but it follows from the facts collected by M. Imbert Goubeyre, that so prompt a cessation is not as common as I had thought, and as M. Blot had stated. Though there are cases, says M. Imbert Goubeyre (memoir quoted), in which the albumen disappears with rapidity, in others it continues, and passes into chronic and confirmed Bright's disease. From a statement by this author, it appears that, of 65 cases of puerperal albuminuria unaccompanied with eclampsia, 21 proved fatal during pregnancy and the lying-in; and 6 from the third to the fourteenth month after delivery; 5 cases became chronic, and were found to be still existent, two, eight, ten, and fourteen months, and seven years after the labor.

I but just now mentioned a case in which albumen was detected in the urine eighteen months after delivery.

These differences appear to me to be due to the greater or less intensity of the disease. When the alteration of the fluids is but slight, especially when it has existed for but a short time, and occurs towards the end of gestation, or only during the labor; when, finally, the active or passive congestion of the kidneys, produced by obstruction of the venous circulation, has had its influence in causing the albuminuria, we can understand how the removal of one of the causes, by delivery, may leave the other incapable of sustaining the functional disorder. But when the alteration is slight, especially when it dates back to the middle or first half of the pregnancy, it may then continue for a long time after delivery. In these latter cases, granular nephritis is often present; but I am much inclined to believe that sometimes the kidney is unchanged, or very slightly altered, notwithstanding the persistence of the albuminuria.

In respect to the prognosis, the coexistence of an alteration of the kidney is of the highest importance; unfortunately, however, the diagnosis during life of this organic lesion is extremely difficult, inasmuch as none of its symptoms are pathognomonic. It would appear, however, from the researches of M. Pickard (thesis, Strasbourg, 1856), that great light may be thrown upon the question by analysis of the blood, since, when the kidneys are diseased, the blood contains an amount of urea much greater than in any other cases of albuminuria; moreover, the quantity of urea is proportionate to the greater or less advanced degree of renal alteration, a very small proportion of urea in the blood generally coinciding with simple congestion of the kidneys.

Has the albuminuria any effect upon the progress of the pregnancy, and upon the life and development of the fœtus? M. Blot thinks that it has not, whilst MM. Cahen, Rayer, and some others, hold the contrary opinion.

I still regard the view of M. Blot as entirely correct for the slight cases, which are, I repeat, the most common; but it does not appear to me well founded as regards those complicated with anasarca, or which begin before the latter half of gestation. I am very much inclined to consider it as being then a frequent cause of abortion, of premature labor, and of death to the fœtus.

We have noticed the views of Simpson and others respecting the frequent occurrence of albuminuria in numerous puerperal disorders. M. Blot considers it a cause of hemorrhage. It is, therefore, as relates to the prognosis, a sign which is always calculated to excite solicitude. As a diagnostic sign it is certainly destined to reveal the nature and etiology of a multitude of affections hitherto of very difficult explanation; therefore, it is now indispensable, in obscure cases, to examine carefully the urine of pregnant women, even when unattended with dropsy. It may possibly be shown in the future that albuminuria is a central point towards which converge a multitude of diseases of various characters, and these researches may throw light upon their treatment, which is still so obscure.

If we have succeeded in showing that an altered state of the blood is the principal cause of puerperal albuminuria, and that this alteration consists chiefly in a diminution of its solid constituents, we shall have no occasion to insist strongly upon the advantages of a reparatory treatment. Unless very evident symptoms of general plethora or renal congestion be present, bleeding would be rather hurtful than useful, in a disease attended with so great impoverishment of the system; therefore a tonic medication should be resorted to from the outset. A good animal diet, assisted by the use of whatever ferruginous preparation will be most readily supported by the patient, ought evidently to form the basis of the treatment. The preparations of Peruvian bark, and other bitters, may be added with advantage.

[*Uræmia.*—We have just said that albuminuria is often accompanied by various nervous disorders (amaurosis, paralysis, eclampsia), the production of which it is very difficult to explain satisfactorily. It will not, however, be forgotten that albuminous urine contains but little urea (see page 494), which being no longer eliminated by the kidneys, must necessarily accumulate in the blood. This fact is supposed to account for the nervous disorders in question, by giving rise to a peculiar poisoning to which the name uræmia is applied. We propose now to state the principal points and successive phases of the doctrine of uræmia, premising, however, that it is liable to numerous objections.

Wilson first, and afterwards Rayer, attributed the nervous complications of albuminuria to the presence of urea in the blood. At first accepted without limitation, this opinion was soon attacked in its very foundation. Cases were cited in which urea was present in large amount in human blood without being attended by any of the so-called uræmic symptoms. Finally, Cl. Bernard, from experiments made by injecting urea into the blood of animals, came to the conclusion that urea is incapable of producing the nervous accidents of albuminuria. Thus Wilson's theory was ruined.

Frerichs came, for a while, to the rescue of the doctrine of uræmia by explaining the facts differently. According to him, urea is, of itself, innocuous, the danger arising from the fact that it is easily decomposed in the blood, giving rise to carbonate of ammonia, which really is poisonous. Frerichs' experiments appeared to be decisive. He injected carbonate of ammonia into the veins of dogs in good health, and after a very short time the expired air contained carbonate of ammonia, and the animals were soon taken with convulsions and coma. The symptoms thus artificially produced bore a strong resemblance to eclampsia, and Frerichs' position seemed for a time to be thoroughly established. It was thus presented in a favorable light in former editions of this work, but since then it has lost ground and its partisans become daily less numerous. The fact is, that the theory is not free from objections; and out of a great number of experiments which go to contravene those of Frerichs, I again cite the opinion of Bernard, which is far from being favorable. This celebrated physiologist asserts that carbonate of ammonia is almost always present in human blood, whether in health or in disease, and the experiments which he undertook satisfied him, moreover, that it is far from being productive of the terrible nervous symptoms which have been attributed to it. "If," says the learned professor, "carbonate of ammonia be injected in small quantity, it produces no effect. When thrown in larger amount into the blood of a dog, the animal cried and was extremely agitated for a considerable time: nevertheless it recovered." From these experiments Bernard concludes that eclampsia cannot be explained by carbonate of ammonia. The same opinion is given in the excellent thesis for the Concours, of my colleague Dr. Fournier; and, for my own part, I would say with him that Frerichs' doctrine, ingenious and learned though it be, will not bear severe scrutiny. (Fournier, *Thèse de Concours pour l'Agrégation*, 1863.)

At present, the position can no longer be sustained that uræmic symptoms are due to the presence in the blood of any single principle, whether urea or carbonate of ammonia. Schottin assumes that substances imperfectly known as yet, and vaguely styled *extractive matters*, may accompany the urea, remain in the blood, and give rise to a poisoning which Gubler proposed to call *urinæmia*. This last mode of interpreting the facts is an approximation, perhaps, to the truth, though it is far from proven that it represents it precisely.

"If the doctrine of uræmia or of urinæmia be accepted as true, how shall the nervous troubles which it produces be explained? Here come in what have been termed the nervous theories of uræmia. Certain authors, as Traube and Sée, regard the nervous phenomena of uræmia as somewhat analogous, as respects the intrinsic mode of production, with the pathogenic process which Kusmans, Tenner, and others assign to epilepsy. Through some change in the blood an excitement is produced of the vaso-motor nerves and the cerebral arteries. These arteries contract, and there result either oligæmia of the medulla oblongata giving rise to convulsions, or the same condition of the encephalon giving rise to coma." (Fournier, *Thèse de Concours.*)

In short, the clinical facts are real, and all physicians have occasion to see how frequently nervous troubles arise in the course of an attack of albuminuria. How shall they be explained? Though the question seem at present to be unanswerable, I have deemed it my duty to exhibit the present state of knowledge on the subject. Should the doctrine of uræmia be false and that of urinæmia doubtful, plausible hypotheses would still remain whereby to explain the nervous disorders complicating albuminuria. Other changes in the blood, altered nutrition of the nervous tissue (Gubler), hyperæmia or anæmia of the encephalon, serous effusions upon the surface of or in the cavities of the brain (Rilliet, Natalis Guillot), and œdema of the cerebral substance, are all circumstances capable of explaining the convulsive phenomena and concomitant symptoms observed in certain forms of albuminuria. (Gubler.)

One other difficulty remains to be mentioned. What are the nervous disorders observed in cases of albuminuria? In the first place we would mention cephalalgia, troubled vision and hearing, vomiting, coma and eclampsia. Up to this point there is no disagreement. But are cases of paralysis like hemiplegia or paraplegia ever witnessed? Here is a case of controversy: Churchill and Imbert Goubeyre on the one hand, admit that puerperal paralyses are not uncommon, whilst on the other almost all pathologists, Addison, Sée, Lasègue, Fournier, and Grisolle, remark that paralysis has no place amongst the nervous disorders of albuminuria. When hereafter we come to study puerperal paralysis and include uræmia in their etiology, we shall not lose sight of the difference of opinion upon this subject.

In short, various nervous affections occur in women affected with albuminuria, to explain which the doctrine of uræmia and urinæmia has been invoked, although confidence in it has become very much shaken. All our knowledge on the subject is hypothetical, and further investigation is indispensable to reduce it to any certainty; therefore, whenever we shall mention uræmia in explanation of any pathological condition, our reservation on the matter will be brought to recollection.]

§ 4. Dropsy of the Cellular Tissue.

Another affection of quite frequent occurrence, and one which is often connected with what accoucheurs call plethora, of which, according to Chaussier, it is a variety (serous plethora), is serous infiltration of the cellular tissue. This infiltration begins in the feet, then extends to the legs, thighs, genital parts, and sometimes rising above the lower extremities, invades the trunk, face, upper extremities, and is sometimes even accompanied by effusion into the great serous cavities.

These dropsies, upon which MM. Devilliers and Regnauld have published an interesting memoir, are by them divided into: 1, simple œdemas; 2, œdemas connected with affection of the central organs of respiration and circulation; 3, œdemas with albuminuria.

The œdema connected with lesions of the organs of circulation generally increases during pregnancy, but this increase is especially due to the unfortunate influence which gestation has upon all organic lesions, and we have no occasion to speak of it further. As regards the two other species, we think it proper, in order to avoid repetition, to include them in the same description; for though they have some special characters upon which we shall have to insist, they resemble each other in a great many particulars.

The *causes* of the serous infiltrations which occur during pregnancy, may be divided into general and local. As first in importance of the general causes, we must rank the decrease in the proportion of albumen; a decrease which has been discovered by all observers in the blood of pregnant women. According to M. Andral, this special alteration of the blood is the only one which necessarily produces dropsy. The amount of effusion is dependent upon the extent of the alteration, which, if considerable, is often attended with albuminuria.

Hydræmia, or serous plethora, which also produces œdema in certain chlorotic patients, may also give rise to the same symptom during pregnancy, and assist in the production of serous infiltrations. When these general alterations of the economy are but slight, they usually would be unequal to the production of œdema, did not the development of the womb add its local action to their own.

The pressure of the womb upon the surrounding parts from early pregnancy, and the obstruction which it occasions to the performance of the functions of the central organs of respiration and circulation at an advanced stage, when by rising into the epigastric region it forces up the diaphragm and thus diminishes the thoracic cavity, explain why the œdema commences in the lower extremities, and why it generally does not extend until a much later period to the trunk and upper extremities.

Progress and Symptoms.—Generally speaking, the œdema makes its appearance within the last three months of pregnancy, especially when it appears to be due simply to a mechanical obstruction of the circulation. But when it results from one of the general causes before mentioned, it may commence with the pregnancy, or in the third or fourth month. However, as hydræmia, the diminution of the albumen of the blood, and the albuminuria, are most generally observed in the latter half of gestation, we may understand that the dropsy to which they give rise should also be more common towards the seventh, eighth, or ninth month.

The progress of the œdema of pregnancy is generally slow and chronic; sometimes, however, it advances rapidly in a few weeks. Whatever may be the case in this respect, it generally begins by the lower extremities; sometimes affecting one of them, at others both. At first it is limited to the feet and neighborhood of the ankles; sometimes even it never gets farther than the lower part of the legs, though quite frequently it reaches the knees, the thighs, and external genital parts. Occasionally it invades the integuments of the lower part of the trunk, and in some rare cases, generally attended with albuminuria, it affects even the face and hands.

In the early stages, while limited to the lower part of the legs, it disappears at night, in consequence of the horizontal position, and is only well marked towards the close of the day. But when the disease has advanced farther it continues, whatever position the patient assumes; and although the horizontal posture seems to diminish the swelling of the legs, it it only because the infiltrated fluid is displaced to the lower part of the trunk.

The amount of fluid extravasated varies between a slight puffiness and the extreme swelling which makes standing and walking impossible. In the latter case, the parts affected are generally the seat of pain, of sensations of pricking, and sometimes of burning and extreme tension.

The œdema rarely disappears before delivery; on the contrary, it generally increases until near the end of pregnancy. Sometimes, however, as MM. Devilliers and Regnauld have indicated, it undergoes remarkable variations. Thus, it may disappear entirely and finally, or it may return shortly after; sometimes it is observed to leave one member and fix upon the other, which had been but partially affected. These changes are doubtless owing to mechanical causes, the action of which varies or ceases with alterations in the situation of the uterus (Devilliers and Regnauld); but they certainly may also be occasioned by fluctuations in the albuminuria, which may be suspended for a short time and then reappear, as I have witnessed in one case after labor.

Terminations.—The dropsy of pregnant women, however caused, generally disappears quickly after labor; and in cases of albuminuria, the secretion of albumen often ceases with equal rapidity.

Prognosis.—If the dropsy be viewed as a simple fact, independent of the complications which so often attend and follow it, it assumes the position of a merely troublesome affection; but to appreciate the prognosis rightly, it is important to remember that some authors regard the œdema as favoring abortion and premature labor. They also suppose it to be almost uniformly connected with the etiology of eclampsia, and often with the development of puerperal fevers; and finally, that sometimes the disappearance of the effusion after delivery has been followed by a frequently fatal serous congestion of the nervous centres or respiratory organs. The facts related by M. Lasserre leave no doubt in my mind of the truth of the latter proposition. It is especially important to bear in mind, that although these dangerous complications are possible as a consequence of simple œdema, they have been chiefly observed in cases of albuminuria with infiltration, and consequently that the presence of albumen in the urine adds greatly to the gravity of the prognosis. Hence the interest which then attaches to the examination of the urine.

The *treatment* of the dropsy of pregnant females should be conducted with the double purpose of overcoming the organic cause which so frequently produces the œdema, and to stimulate the absorption of the effused fluids. The preparations of iron and a tonic regimen appear to me to be especially called for in a disease which is so frequently connected with hydræmia. The presence of albumen in considerable quantity, even supposing it due to a nephritis, does not contraindicate this treatment. The antiphlogistics recommended by some authors seem to me likely to be more hurtful than useful; and unless the patient suffers very severe lumbar pains, or to the general infiltration are superadded dyspnœa, palpitations, extreme giddiness, and especially evident indications of uterine congestion, threatening abortion, I should think it right to prescribe bleeding. Even under the latter circumstances, I would employ it less as an antiphlogistic than as a revulsive, nor would I discontinue the use of the iron.

To assist the absorption of the effused fluids, mild laxatives, diuretics, and dry frictions may be used. To these may be added vapor-baths, provided the patient is able to bear them without danger of cerebral congestion.

If the distention and size of the lower extremities is so great as to make walking impossible and cause great suffering, and if the genital parts are greatly swollen, their disengorgement may be facilitated by practising small incisions, or, at least, a number of punctures, with the lancet or a needle. In several cases I have derived benefit from keeping compresses, saturated with cold water, applied to the limbs for several days. Levret advises blisters between the thighs and external labia, aided by slight punctures on the feet; but inasmuch as the application of blisters upon a highly œdematous limb is sometimes attended with serious consequences, I think it prudent to abstain from them.

§ 5. ASCITES.

We have already stated, that dropsy during pregnancy was so far from being limited to the subcutaneous cellular tissue, that collections of fluid of variable amount might take place in the great cavities of the body. The effusion within the abdomen may occupy different locations: thus, it may accumulate within the amnion, and constitute dropsy of the amnion; or between the membranes of the ovum and the internal surface of the womb, in which case it furnishes the fluid that gives rise to hydrorrhœa; finally, by collecting within the cavity of the peritoneum, it forms a true ascites.

Either of these varieties of dropsy may occur separately, or two of them may coexist in the same female, as is often the case with ascites and hydramnion. We shall treat first of ascites.

This affection sometimes makes its appearance in the first half of the pregnancy, though usually towards the fifth or sixth month, rarely later. When the accumulation begins very early, it sometimes progresses so rapidly that the abdomen is larger at the fifth month than at the usual term of gestation, and as the infiltration of the lower extremities generally keeps pace with the effusion in the abdomen, the patients find it impossible either to walk or pursue their occupations.

The progress of the ascites increases rapidly; the face is puffed and livid; the abdominal walls, much thickened by infiltration, add to the size of the belly; the skin covering them, although distended and shining, sometimes has a tuberculous appearance, as in elephantiasis. The umbilicus usually forms a smooth, rounded, translucent tumor, of the shape and size of a hen's egg, at the base of which the umbilical ring may be felt, though it is too much distended to produce any circular constriction.

The greater labia share in the general infiltration, are enormously swollen, and affected with a painful irritation, produced by their constant friction against each other, and contact with the urine.

The skin of the lower extremities is so distended as to seem ready to burst at several points, and is exceedingly painful.

The progressive accumulation of fluid in the cavity of the peritoneum soon obstructs the regular performance of the thoracic functions; the dyspnœa becomes extreme, the respiration very short, wheezing, and painful; the patient is obliged to remain seated night and day; yet, notwithstanding this position, the hæmatosis is so imperfect that she seems threatened with suffocation at every instant, and has frequent attacks of faintness. The suffering condition is aggravated by almost constant insomnia, intense headache, extreme thirst, and disgust for food.

Percussion of the abdomen detects readily the presence of a large amount of fluid in its cavity, though the fluctuation is not equal in all parts of it. As Scarpa remarks, it is slight or absent in the hypogastrium and towards the flanks, is manifest near the hypochondriac regions, and very well marked in the left hypochondrium, near the edges of the cartilages of the false ribs.

The enormous distention of the parietes of the abdomen frequently prevents the uterus from being felt, and its elevation determined with precision. The motions of the child, though generally obscure, are, however, still perceived by the mother.

The prognosis of ascites complicating pregnancy is grave in proportion as it dates farther from the term of gestation. When it appears only in the latter months, there is every reason to hope that, notwithstanding its rapid progress, it will be arrested by delivery, before producing such disorders as seriously to compromise the life of the mother, and that, as in the observation of M. Prestat, the recency of the effusion will render its absorption easy after delivery. But when the ascites begins within the first half of the pregnancy, there is great cause for fear, should it progress rapidly, lest paracentesis should be demanded long before the ninth month. It were useless to add, that the prognosis will be far graver, if, as unfortunately very often happens, the ascites should coexist with dropsy of the amnion. If, says Scarpa, there should fortunately be no uterine dropsy, the paracentesis may allow the pregnancy to progress favorably through its usual stages; but, under the opposite circumstances, it almost always happens that the womb, being excited by sympathy, contracts, and delivery follows.

Treatment.—The general bleeding, purgatives, and diuretics, employed with the design of retarding the advancement of the disease, have not seemed to influence its later progress, and it is conceivable that a too long-continued use of them might be prejudicial to the pregnancy. They should, therefore, be resorted to with the greatest reserve, and relinquished as soon as found to be unsuccessful.

When the disease has increased to such an extent as to threaten the life of the patient, it is evident that the only resource consists in the evacuation of the fluid. But where should the puncture be made?

The development of the uterus makes it impossible to insert the trocar at the place of selection in ordinary ascites. From the circumstance of the fluctuation being particularly well marked in the left hypochondrium, the prominence of which was greatest near the edge of the false ribs, Scarpa introduced his instrument between the uppermost part of the external border of the rectus muscle and the edge of the false ribs in the left hypochondrium. The patient aborted two days after, and recovered.

George Langstaff made an incision two inches above the umbilicus, exposed the peritoneum, and punctured it with a medium-sized trocar, being careful to introduce it but a short distance so as not to wound the uterus. He had thus given issue to about ten pints of fluid, when the womb came in contact with the end of the canula, interrupting the flow, and occasioning so much pain as to oblige him to withdraw the instrument. As the patient was unable to endure any pressure, he introduced a medium-sized gum-elastic catheter by the opening, directing it between the peritoneum and the anterior surface of the uterus. *Peritonitis followed eight hours after the operation;* three days subsequently to the operation she aborted, and three weeks later she was well.

Finally, in a case in which a considerable tumor existed at the umbilicus, Ollivier, of Angers, was decided by the tension and thinness of the skin at the part to make use of the lancet simply. This instrument was introduced in the same manner and to the same depth, as for bleeding, at the middle and front part of the tumor, at the distance of half an inch from the circumference of the ring. The water flowed immediately to the amount of sixteen pounds.

For twelve days, the serum continued to flow by the little wound, which was closed hermetically on the thirteenth. The patient, who had been relieved at once, experienced a return of the accidents with the fresh accumulation of fluid. Twenty-eight days after the first puncture, it became necessary to repeat it; eight pounds of fluid were discharged, and the same alleviation followed. Twelve days after this, the woman was delivered of a living, though feeble child, and in fifteen days was discharged cured.

This simple process, consisting of a small puncture with the lancet, seems to me preferable to Scarpa's operation in the hypogastrium. The latter might, in some cases, endanger important organs, and could only be preferred on account of the existence of an old umbilical hernia with adhesions of the intestines to the sac. The presence of this complication can be readily discovered by holding a candle behind the thin and transparent walls of the umbilical tumor, as for the diagnosis of hydrocele, when the opacity of the exomphalos will be at once detected.

There is no advantage in placing a foreign body in the small opening, since the flow of serum keeps the sides separated, and the density and extreme thinness of the walls of the tumor prevent infiltration of the abdominal parietes. The observation of Langstaff, above cited, as also another fact related by M. Danyau, prove that the introduction of a foreign body exposes to peritonitis.

When the pregnancy has made but slight progress, the only resource evidently consists in the puncture; but when the ascites endangers the mother's life only at the eighth or ninth month, is it allowable to think of premature artificial delivery?

If the uterine dropsy, of which we are about to speak in detail, complicates the ascites, and we are able to ascertain that the sufferings of the patient are in good measure due to the extreme size of the uterus, I think the tapping would be insufficient, and that the artificial induction of labor may be attempted with advantage; still, though common, the hydramnion is not a necessary complication, and it seems to me that ascites can very rarely require premature delivery.

In the eighth, and especially the ninth month, the evacuation of the peritoneal fluid will afford sufficiently lasting relief to enable the woman to reach the regular term of pregnancy; or, at least, it will rarely be necessary to repeat the operation more than once. Such was the case with the patient of Ollivier. The only fault to be found with the puncture is that of being merely palliatory, whilst it exhausts the strength if frequently repeated. But should the relief afforded be such that one or two punctures enable the patient to reach the end of the ninth month with moderate suffering, I see no reason for not preferring it to premature delivery, which always places the child in unfavorable conditions.

ARTICLE V.

LESIONS OF INNERVATION.

§ 1. ECLAMPSIA.

On account of its danger and the nature of the convulsions which characterize eclampsia takes the foremost rank in the diseases of women. It is liable to pear suddenly either during pregnancy, at the moment of delivery, or subsequent the removal of the placenta; it occurs, however, more frequently during labor, d will, therefore, be studied in connection with the accidents of dystocia. (See stocia.

2. VERTIGO. GIDDINESS. LIPOTHYMIA. SYNCOPE.

These affections are due to various causes. Usually they seem to depend upon at nervous susceptibility, occasioned by pregnancy and heightened by chlorosis;

less frequently they result from plethora, in which case blood-letting becomes, exceptionally, the best method of treating them. Sometimes, also, vertigo and giddiness accompany albuminuria, and precede eclampsia. (See *Albuminuria*, and *Eclampsia.*) In the majority of cases, neither plethora, albuminuria, nor eclampsia are observed in connection, so that the above-named affections seem to be due simply to a perverted action of the nervous system; an unsatisfactory explanation, but really the only one which can possibly be given.]

Thus some delicate, nervous women are subject to faintings, from the most trifling cause, when they are pregnant; any strong moral impulses, such as joy, or anger, and sometimes even an odor that is a little too penetrating, or the sight of an unpleasant object or person, may give rise to this condition. Gardien relates an instance, where the simple movements of a child produced swoonings; and I have attended a lady who fainted three or four times a week, during the second, third, and fourth months of her gestation, without any satisfactory cause being discovered for it.

Ordinarily, the syncope attacks the woman when standing, and she at once experiences a ringing in her ears, vertigo, dimness of vision, weakness in the knees, and she has scarcely time to sit down, before she faints away. Some females, however, are warned of the attack by the occurrence of yawning, and a sensation of heat in the precordial region; soon after, the extremities become cold, the face grows pallid, and is covered with a cold sweat; the senses and intellectual faculties are almost lost, the pulse and respiration have nearly ceased, though a total loss of the intelligence and sensibility is very rare. For my own part, I have never seen any woman in this latter state, since nearly all those whom I have carefully questioned on the subject have stated that they had a confused idea of what was passing around them; and therefore, if there really be any instances of a complete abolition of the faculties, they certainly are not so frequent as the authors would have us believe.

While the syncope lasts, we should employ the ordinary means, such as ammonia, vinegar, cold water, &c., &c. The tonics combined with antispasmodics have been recommended for its prevention: for instance, Van Swieten highly extols the use of orange-peel with canella, or lemon-rind and canella, in the proportion of two or three drachms to three pounds of sherry-wine, of which three or four tablespoonfuls are to be taken daily. Chambon has employed an infusion of peach-blossoms with success. All these nervous disorders are more alarming than serious. We have never known them to endanger the life of the mother, or to disturb the regular course of gestation.

The attacks of fainting, though generally short, are sometimes quite prolonged. In the latter case, they are frequently accompanied or followed by some hysterical symptoms, as sense of oppression, hypogastric pain, constriction of the fauces, and sometimes true hysterical convulsions. In the case of a young lady, a patient of M. Rayer's, these symptoms occurred almost every evening after dinner, during the last three months of her pregnancy. They had no serious consequence, unless a threatening of premature labor towards the end of the eighth month be so regarded, which, however, yielded to a small bleeding and opiate injections.

§ 3. VARIOUS FORMS OF NEURALGIA. ODONTALGIA.

Various forms of cephalalgia and obstinate hemicrania are often observed during pregnancy. Other neuralgias may also occur with their usual symptoms in various situations. The sensibility of the skin sometimes becomes so acute that the slightest touch gives pain; again there may be the sensation of intense heat in the feet and hands, or else an impression of cold which nothing will remove. (Jacquemier.) The walls of the abdomen are often affected with neuralgic pains, which will be studied hereafter in an article devoted to the subject. (See *Abdominal Pains.*)

Odontalgia is the most common of all the neuralgias of pregnant women. The lower jaw is the one usually affected, the pain sometimes invading one side, sometimes both sides together. It usually occurs during the first half of gestation, not unfrequently commencing shortly after conception, of which it is sometimes the first sign. It commonly ceases from the fourth to the sixth month.

It were not exactly correct to say that every case of odontalgia is a true neuralgia, inasmuch as it is often occasioned by a carious tooth. It therefore becomes necessary, in view of treatment, to make a correct diagnosis, and in order to do so, to give the mouth a very careful examination. (Churchill.)

Mauriceau considered bleeding the best remedy for the toothache of pregnant women, yet it is a measure by no means certain, and in some cases entirely inadmissible. It is recommended to guard against constipation by the use of mild purgatives taken at short intervals, and as local applications, the use of gargles containing opium, and plasters of opium and hyoscyamus. Internally, some of the preparations recommended for facial neuralgias may be tried; such as pills of cynoglossus or Meglin's pills. Should the paroxysms and remissions be well marked, and more especially should there be an actual intermission, the best effects might be anticipated from the use of quinine. No active measures should be resorted to unless the pain be very great, depriving the patient of sleep and rendering mastication almost impossible, for the contact of foreign bodies with the teeth is sometimes insupportable. (Jacquemier.) Capuron says that toothaches which had resisted all kinds of remedies have been known to subside spontaneously about the third or fourth month of gestation.

Should the gums be inflamed, one or more leeches might be applied. If the trouble is occasioned by a carious tooth, efforts should be made to relieve it by the measures commonly employed, the best being cauterization of the offending tooth. As most authors think that extraction might cause abortion, it would be well to advise patients not to undergo the operation.

§ 4. PARALYSIS.

Pregnant women are not exempt from the causes which produce paralysis under ordinary circumstances, but are even more liable thereto than other females of their age. That such is the fact the recent researches of Fleetwood Churchill and Imbert-Gourbeyre have established beyond a doubt.

Churchill reports 34 cases of paralysis derived from various authors or observed by himself. In 22 of them, the attack occurred during pregnancy, and in the remaining 12, either during or after labor. The location of the paralysis is noted as follows: 17 cases of complete hemiplegia and 1 in which it was partial; 4 of paraplegia, in 2 of which but one leg was paralyzed; 6 of facial paralysis, 3 of amaurosis, and 3 of deafness; in some of the latter cases, however, the local affection was connected with hemiplegia. Of these 34 cases, 4 were fatal.

Of the 22 cases occurring during pregnancy there were 12 of hemiplegia, 1 of paraplegia, 4 of facial paralysis, 2 of amaurosis, and 3 of deafness. Analysis of these cases shows no regularity in regard to the period of gestation at which the attack occurred, though it seems that the patients were more liable to the affection during the latter months. Most of them recovered before or after delivery, though some continued to be affected for a considerable time. But one case was fatal, and in this it was evident that the result was due to a disease of the brain antecedent to the pregnancy rather than to the paralysis which had increased during the latter; so that this single case by no means invalidates the conclusion as to the relatively trivial character of these attacks during pregnancy.

It is often very difficult to determine precisely the influence which pregnancy may have in the production of the paralysis. In our brief exposition of the state of knowledge on the subject, we shall have in view only such cases as occur during pregnancy, and thus endeavor to avoid being led off into the general subject of internal pathology.

The causes of puerperal paralysis are various; in the first place we would mention cerebral apoplexy, which is not very uncommon in pregnant women. Ménière reports in his excellent treatise several cases of the kind, and, at a later date, M. P. Dubois, whilst discussing the subject in a clinical lecture, came to the conclusion that the frequency of its occurrence proves the existence of some connection between it and the pregnant condition. How then shall the connection be explained? By plethora or hypertrophy of the heart? Both these views could doubtless be well defended, but M. Imbert-Gourbeyre believes that the apoplexy is due to albuminuria, which is well known to be common during gestation. He cites in support of his view several cases of Bright's disease which terminated in cerebral hemorrhage, and calls to mind that it is by no means a rare attendant upon eclampsia. More well observed cases are necessary to enable us to determine conclusively the value of this opinion,

According to Churchill and Imbert-Gourbeyre, uræmia is almost the only cause of puerperal paralyses, such as amaurosis, deafness, and hemiplegia. As regards amaurosis and deafness, we freely accept their opinion, but have some doubt as regards hemiplegia. Most authors, in fact, think that uræmia never occasions either hemiplegia or paraplegia (see *Uræmia*), but however this may be, the so-called uræmic paralyses sometimes accompany an attack of eclampsia or else are preceded by it.

After cerebral hemorrhage and uræmia, anæmia deserves to be mentioned, as also hysteria, a reflex action whose point of departure is located in the uterus, but whose influence extends to the spinal marrow;—rheumatism, etc., may also be noted as causes.

We have thus endeavored to show that the causes of puerperal paralyses are both numerous and variable, so that it will be evident that the prognosis and treatment will have to be modified in the different cases. The ordinary rules of pathology must serve as a guide in the course of medication to be followed.

1. *Amaurosis,* — which is of common occurrence in cases of albuminuria.

It varies in degree from the slightest amblyopia to perfect blindness. It usually affects both eyes, though Imbert-Gourbeyre says that he has known but one eye to be involved. Though generally of short duration, it may sometimes become permanent and incurable. It may also be the first symptom to call the attention of the physician to the possible existence of albuminuria, and is therefore of the greatest value as a premonitory symptom in the diagnosis of eclampsia (see *Eclampsia*). It may make its appearance before, during, and after labor, and recur in several successive pregnancies. If the eyes be examined with the ophthalmoscope, the retina will sometimes appear to be healthy, whilst at others a fatty alteration will be observed or an effusion of blood; regard will be had to the latter in the formation of a prognosis.

2. *Deafness.*—Puerperal deafness is less frequent than amaurosis, and like it connected with albuminuria and caused by uræmia. The deafness is generally imperfect and almost always preceded by roaring in the ears. Like amaurosis —

may be intermittent, permanent, periodical, single or bilateral; may change into exaltation of the sense of hearing, be connected with other symptoms of albuminuria, or exist alone, although it accompanies amaurosis as it were by preference. We shall learn hereafter (see *Eclampsia*), that buzzing in the ears and deafness often precede and announce an attack of eclampsia (Imbert-Gourbeyre.)

3. *Facial Paralysis.*—In connection with amaurosis and deafness may be placed paralysis of the third and seventh pairs of nerves—although it is much less frequent.

4. *Hemiplegia.*—Hemiplegia during pregnancy is of common occurrence, and M. Imbert-Gourbeyre has reported a large number of cases in his memoir. Sometimes it is caused by cerebral apoplexy; at others, no lesion of the nervous centres is discoverable at the autopsy, whilst the numerous examples of rapid and permanent recovery seem to prove that there could have been no grave lesion of the brain or spinal marrow. Albuminuria alone and often eclampsia have been observed with hemiplegia, so that Imbert-Gourbeyre feels no hesitation in saying that uræmia is the usual cause of this form of paralysis. As has been said, we do not partake wholly of this view (see *Uræmia*).

Hemiplegia may sometimes also be caused by anæmia, as shown by the following case: A young lady had, during the early months of her pregnancy, an imperfect hemiplegia characterized only by weakness and numbness. The symptoms were of short duration and recovery rapid and complete. In the absence of any other appreciable cause, the affection seemed to be due to a well-marked chlorotic condition.

Paralyses are not rare in hysterical women. There is nothing to prove that pregnant females enjoy any immunity in this respect, so that should any of the symptoms peculiar to hysteria exhibit themselves, it would be reasonable to attribute the paralysis to the pre-existing neurosis. In some patients even, the hysteria may appear for the first time during pregnancy and be attended by various paralyses. It ought, however, to be noted that hemiplegia is rarely dependent upon hysteria.

Finally, when no cause can be discovered, we say, in order to conceal our ignorance, that the paralysis is essential.

5. *Paraplegia.*—Beside the usual causes of paraplegia, and independently of all those above noted, this paralysis may be occasioned by pressure of the fœtal head upon the nerves of the pelvic cavity or by reflex action. Paraplegia from pressure upon the nerves by the head ought to be rare during pregnancy; it has been more commonly witnessed during labor and after delivery, especially when the labor has been severe or attended with hemorrhage; we have nothing further to say in regard to this cause.

It is acknowledged, as stated, that paraplegia may be caused by reflex action; but how, in these cases, can its production be explained? How can a partial excitement of the uterus so react upon the spinal marrow as to suspend its functions? Without pausing before the various theories proposed by modern physiologists, we would say that, according to M. Jaccoud who wrote a remarkable work upon the subject, paralysis is occasioned by exhaustion of the nervous system, and that numerous experiments upon animals tend, at least, to prove the correctness of his view: "A long continued, abnormal, excitement is transmitted to the spinal cord by the uterine nerves: after a longer or shorter time it exhausts the excitability peculiar to the corresponding region of the organ, and the inertia of these nervous elements under the action of the brain closes the avenues by which the motor impulse is transmitted; as a necessary consequence of this state of things there results paralysis of all parts situated below the affected points."

The following case of Echeverria's, which the author and others after his example have given as a type of the so-called reflex paraplegia is, to my mind, an absolute demonstration of the theory just stated,—allowing the finger to be laid, as it were, upon the pathological mechanism of the paralytic affection. A woman who had miscarried three times, continued to suffer after the last one severe pain in the hypogastrium accompanied by a slight metrorrhagia. Seventeen days after the abortion the uterus was found to be anteverted; it was soft and voluminous, rising an inch above the pubis; the neck was sensitive, bled easily, and admitted the finger; the anterior lip was covered by a painful ulcer of a violet-red color.

Having determined these facts, Echeverria, with the double object of exciting the contraction of the uterus and hastening the cicatrization of the ulcer, had recourse to electricity by placing one pole of the apparatus upon the pubis, the other in the orifice of the cervix, and then transmitting a current of low power. Instantly violent pain was experienced in the womb, loins, and lower extremities, which were seized with convulsive tremors. The current was immediately suspended, when it was found that in place of the convulsion there was complete paraplegia which lasted for fourteen hours (Jaccoud). Is it not evident that we have here a case in which extreme excitement exhausted the irritability of the spinal cord? Loss of motion resulting and continuing until the functions of the nervous centre had been restored by adequate repose.

The causes of paraplegia may be various and combined, of which the following case is an example. A young primiparous lady, of extremely lymphatic temperament and affected with general œdema, had a tedious labor requiring the use of the forceps. Extensive laceration of the perineum occurred, and profuse hemorrhage attended the delivery of the placenta. The lying-in was also complicated by a double phlegmasia alba dolens, pleuritic effusion, and ascites. I attended this patient with my friend Dr. Siredey, now hospital physician, and we assured ourselves at various times that the urine contained no albumen. When convalescence was established, it was found on getting the patient up that she had paraplegia. For several months she was unable to stand, but the power of motion gradually returned until at length walking was possible with the assistance of a cane. Whilst this improvement was in progress the paraplegia suddenly became complete, the aggravation being afterward found to have coincided with the time of her becoming again pregnant; and throughout the gestation no improvement took place. During labor the limbs were thrown wildly about in a way which the patient would have been incapable of doing by any exertion of her will. After delivery the power of motion was again wanting. The paraplegia continued for several months without much amelioration, but finally disappeared under the use of strychnine and electricity, the recovery having been now for a long time perfect. In this case, thus briefly related, it would be reasonable to refer the beginning of the paralysis either to pressure by the head of the child during the first labor, or to the hemorrhage attending the delivery of the placenta; but how shall we explain the recurrence of the affection during the next pregnancy? In my opinion, the cause of the new phase of the disease must be regarded as an instance of reflex action.]

§ 5. INTELLECTUAL DISORDERS. INSANITY.

Those physicians who may be willing to admit the truth of the analogy which we have endeavored to establish between the sympathetic disorders of pregnancy, and those observed in young girls suffering from difficult or irregular menstruation (p. 462), will readily understand the functional aberrations of the intellectual and sensorial faculties so often observed in pregnant women.

The pre-existing alterations of certain organs of the senses are sometimes very happily modified by the occurrence of pregnancy. A young woman, whose imperfect vision had obliged her to use spectacles from childhood, found her sight so much improved immediately after the beginning of pregnancy as no longer to have need of glasses. (Obs. de Salmat, Cent. III. Obs. 27.)

At other times there is greater or less disturbance of the affective and intellectual faculties. I knew a young lady pregnant for the first time, whose former love for her husband was replaced by an antipathy which she was barely able to overcome. Another young woman, when five months gone, was suddenly seized with such an aversion for her apartment, that after many fruitless efforts, and notwithstanding all the force of her reason, she had to be left in the country for the remainder of her pregnancy.

Some exhibit a peculiar tendency to sadness, which is mentioned by Burns, and of which I have observed two cases. Certain individuals, who are usually of a gay disposition, suddenly become sad and morose; refuse all the enjoyments tendered to them, and entertain the belief that they will not survive their labor, with a tenacity that nothing can overcome. A young American lady, recommended to my care by M. Rayer, exhibited a profound melancholy for the last six weeks of her pregnancy. Although surrounded by her family, she declined all the pleasures of the capital. She wept unceasingly over her inevitable end, which was so near at hand, and was constantly expressing her distress at being obliged to leave all whom she loved. She had a happy labor, and from the next day her usual gayety was resumed.

[Disorders of intelligence may proceed even to insanity; although this form is more common with newly-delivered females than with pregnant women. Marcé's excellent book, which shall be our guide in the preparation of this article, gives as the result of several collections of statistics, that of 310 cases of puerperal insanity 27 came on during pregnancy, 180 after delivery, and 103 during lactation.

Puerperal insanity may date from the time of conception, or may appear during the course of gestation. In 19 of Marcé's cases it commenced with conception eight times, and in the remaining eleven during pregnancy. It began three times in the third month, once in the fourth month, three times in the sixth month, twice in the seventh month, and twice at times which could not be clearly ascertained. Melancholy seems to be the most common form of this insanity. Analysis of the above-mentioned 19 cases shows that the duration of the disease is very variable. Seven times the recovery dated from delivery; twice only did it occur during the course of gestation; nine times the disease continued, or else did not subside until long after delivery; finally, in one case, the delirium was exasperated by delivery, and death occurred shortly after. The physician ought, therefore, to be very guarded in his statements when questioned in regard to the probable result. It is well also to know that when a woman becomes insane during gestation, there is reason to fear a recurrence, should she again become pregnant.

Montgomery mentions the case of a woman who became insane at the commencement of three successive pregnancies. In another case, the derangement recurred in eight pregnancies, and ceased only after delivery. By a curious anomaly, however, it happens that some women suffer from this affection in one of their pregnancies only.

Hitherto we have studied the influence of pregnancy as productive of mental alienation; but there remains another question, the discussion of which will not be devoid of interest, to wit: What are the effects of pregnancy occurring in a woman who is already insane? In regard to this, Esquirol says, "Pregnancy, labor, and lactation are sometimes used by nature as a means of curing insanity, though, in my opinion, this result is rare." Almost always, indeed, pregnancy gives to mental alienation a character of extreme gravity, either as regards its form or its duration. It is evident, therefore, that the practice of some physicians who recommend pregnancy for insane women cannot be too strongly censured.

Labor itself, in its last stages, especially when the pains are extremely severe, may occasion disorder of the intellectual faculties. All accoucheurs, indeed, have described the excitement of mind which occurs under these circumstances, and which in some rare cases assumes the form of maniacal delirium. To the examples already noted on page 300, we add the following. A woman in the hospital of the Clinique was suddenly, when near the termination of her labor, afflicted with a complete hallucination; she saw a spectre at the foot of her bed, endeavoring to injure her, and which she made strong efforts to drive away. The illusion lasted hardly two minutes before her mind became perfectly sane. The transitory insanity occurring thus during labor is doubtless caused by the excessive pain. Notwithstanding its apparent gravity, it is rarely followed by serious consequences if care be taken, by sufficient watchfulness, to prevent the lamentable acts to which the patients might be impelled. It subsides spontaneously, and very rarely passes into long-continued mania.

The part of the physician, in these cases, is easily pointed out. Generally everything will be left to nature; but should the labor last too long, delivery should be effected by the forceps. Blood-letting at a later period, should it be indicated by the signs of plethora, antispasmodics and judicious expectant conduct, will suffice for the successful management of an occurrence which in itself presents but little gravity.

There remain a few observations to be made upon the subject of the insanity of lying-in women and nurses, known as *puerperal insanity*. As predisposing causes of this affection may be mentioned inheritance, numerous pregnancies, advanced age of the subjects, previous attacks of insanity, eclampsia, and the return of menstruation. Sometimes the disease commences suddenly, but is often preceded by an accelerated pulse, heat of skin, dryness of tongue, thirst, and the entire assemblage of pyretic symptoms.

The various forms of mental alienation are far from occurring with equal frequency under these circumstances, but may be represented in the following order: first, mania; secondly, melancholia and partial insanity.

The mania of lying-in women ends in recovery, incurability, and, in some rare instances, death. Of these, recovery is by far the most frequent termination, and may be said to include about two-thirds of the entire number of cases. Cases are mentioned in which the affection subsided in less than three days, though it more commonly terminates within the first month following the commencement of the attack. Again, recovery may be postponed as late as the sixth month, or not take place until after one, two, or more years. The prognosis is most favorable in melancholia and monomania.

A great variety of remedies have been recommended in the treatment of puerperal mania. Warm baths, purgatives, and narcotics are the most available at the outset. It is of the greatest importance to watch the patients, and not lose sight of them for a moment. The children should be taken away (Marcé).]

ARTICLE VI.

DISEASES OF THE SKIN.

§ 1. ITCHING.

The skin, during pregnancy, is sometimes affected with extreme itching without any appreciable lesion. M. Maslieurat-Lagemart has published a remarkable case of a lady who, in eight successive pregnancies, was afflicted with itchings so violent as to produce premature labors. On four occasions, they began in the sixth month, twice at eight months and a half, and twice in the seventh month. They appeared almost instantly over the entire cutaneous surface; the legs, thighs, genital parts, the whole trunk, the neck, face, scalp, were all affected; nothing escaped but the palms of the hands, and even they were invaded at a later period. So severe were they, that the violent rubbings of the poor sufferer excoriated the skin. Hardly was she delivered when they vanished entirely. The skin retained its natural transparency, color, and brightness throughout. Simple and alkaline baths, ammoniacal and camphorated frictions to the spine, preparations of opium, bismuth, valerian, hyoscyamus, belladonna, and bleeding, were all employed without advantage.

Three cases of general itching which I have had occasion to treat, yielded quite promptly to alkaline baths. (Five ounces of carbonate of potash to an entire bath.)

[§ 2. Pigmentary Spots. Pityriasis.

The skin during pregnancy often becomes affected with yellowish spots known as ephelidæ, *chloasma*, and *pityriasis versicolor*. When they appear on the forehead, cheeks, and chin, they receive the common name of *mask*. These spots affect by preference the face, especially the forehead; they vary in size, are almost symmetrical in form, and never extend to the roots of the hair, from which they always are separated by a border of healthy skin. It would seem that the action of light is one of the principal conditions of their formation, and that the shadow of the hair is sufficient to arrest their progress.

M. Hardy, physician of the Hospital St. Louis, classifies them as ephelides and pityriasis.

The *ephelides* make no projection from the surface, and are attended by neither itching nor desquamation; their examination would almost lead one to say that the pigmentary matter had left the healthy parts and collected in the spots, on account of the apparent bleaching of the skin around them. They are the result, simply, of an accumulation of pigment within a circumscribed space. Ephelides often appear in women at the menstrual period, and more especially during pregnancy: they usually vanish after delivery, though, much to the chagrin of those affected, this does not always happen. When they continue, a special treatment, having for its object the production of a superficial inflammation of the skin, will often prove successful. To effect this, M. Hardy recommends frictions to be made twice a day with the following lotion:

℞.—Water, ...	f℥iv.
Corros. Sublim., ...	gr. v.
Sulph. Zinc, ...	ʒss.
Acetate of Lead, ...	3ss.
Alcohol, ...	*q. s.*

to dissolve the corrosive sublimate.

Should the lotion fail, sulphurous douches, especially with the mineral waters of Luchon and Baréges, applied to the affected parts, may be used with advantage.

Pityriasis versicolor, also termed hepatic spots and chloasma of pregnant women, appear in the form of spots bearing strong resemblance to the ephelides. In pityriasis, however, the spots project slightly from the surface of the skin, and the epidermis becomes detached in the form of little scales, either spontaneously or by scratching. They are always accompanied by itching, which is generally slight. The characters just mentioned will suffice to distinguish *pityriasis versicolor* from ephelides, in which there are neither elevation, desquamation, nor itching. Pityriasis versicolor is a parasitic disease, so that the microscope affords another means of diagnosis by exhibiting the spores and numerous ramifications amidst the epithelial scales.

The pityriasis of pregnancy usually declines after delivery, though in some cases it remains and offers great resistance to the treatment employed.

The therapeutic measures are very simple. Sulphurous waters, by lotion or douche, and ointments containing sulphur, are often effectual. The above lotion (see formula) and nitric acid ointment produce similar results.]

ARTICLE VII.

LESIONS OF THE PELVIC ARTICULATIONS.

§ 1. Relaxation of the Pelvic Articulations.

The question has long been agitated whether the ligaments which unite the bones of the pelvis are ever softened, and whether the articulations are movable. Ambrose Paré himself, that great surgical luminary, did not adopt the opinion of Hippocrates until after Severin Pineau made a dissection, in 1569, of a woman recently delivered, in his presence. But, at the present day, this question is determined by a very great number of cases, and it is now generally admitted that a ramollissement of the symphyses actually occurs in most females during gestation.

This softening may be and generally is slight; though it may be carried to so great an extent as to admit of considerable separation between the articular surfaces, constituting then a true pathological alteration. Hunter, Morgagni, and some others, cite instances where the relaxation was such that the pubes could be drawn more than an inch apart.

With our present knowledge on the subject, it is impossible to explain the cause of this softening; for, when trifling, it generally escapes the notice both of the woman and her physician; but if well marked, a separation of the bones takes place as just stated.

Authors do not agree as to the manner in which the separation is produced; since, according to some, the cartilages are softened and thickened by the liquids that penetrate them, acting like a piece of prepared sponge placed between two bones to absorb the effused fluids; whilst others imagine them to resemble the roots of the ivy, which insinuate themselves into the little crevices between the stones of a wall, and finally overturn it. Louis thinks they act more like dry and porous wooden wedges placed in the fissures of a rock, which, by imbibing moisture, swell up and ultimately split the rock,—or like polypi in the nasal fossæ and frontal or maxillary sinuses.

M. Lenoir supposes that a slight degree of this relaxation is due simply to serous infiltration of the pelvic ligaments resulting from the pregnant condition; the articular surfaces are, therefore, not separated, though separation is possible under the influence of actions tending to produce it. In the more advanced stages, he adds to this softening a hypersecretion of synovia, which distends the articular cavities, and separates the bones that constitute them. Mobility in these cases is great, and if the joints be opened in the dead body, a viscid fluid is discharged abundantly, as was once observed by Morgagni.

This relaxation may, according to Baudelocque, oppose the spontaneous termination of the labor, by destroying the *point d'appui* which the abdominal muscles derive from the bones of the pelvis; and perhaps, also, the distress produced by the engagement of the head, forces the woman to restrain the pains as much as possible; though, on the other hand, from the observations of Desormeaux, Smellie, &c., we learn that this circumstance, so far from being a cause of dystocia, has actually permitted a spontaneous delivery in some cases where the disproportion between the size of the head and the dimensions of the pelvis would have otherwise rendered it impossible.

[The attention of physicians has, of late years, been again called to the study of the relaxation of the pelvic symphyses by a work of M. Ferdinand Martin, which was soon followed by M. Danyau's report. A special article was devoted to the subject in the previous editions of this work, so that M. Trousseau was wrong in supposing that it had been omitted. (*Leçons Cliniques sur le Relâchement des Symphyses du Bassin*, May, 1865.) Nevertheless, as the affection is still badly understood, frequent errors in diagnosis are the consequence.

The pains in the back which many pregnant women suffer, are due simply to relaxation of the symphyses. To be convinced of the fact it will be sufficient to examine the lumbar region by pressure over the sacro-iliac articulations when, if they be diseased, decided pain will follow. The same remark applies to the symphysis pubis, which is often the seat of the vague pains complained of in the lower part of the abdomen.

In all these cases it is the more easy to be deceived, as the patients, on being questioned, are rarely able to define clearly the seat of their suffering, and the real affection is overlooked if care be not taken to make a direct examination. How often is the uterus regarded as the source of the pain, when the lesion is precisely located in the pelvic articulations!

The spontaneous pains produced by relaxation of the pelvic symphyses are more particularly awakened by motion of the lower extremities, as in walking and standing, and usually subside upon lying down. In slight cases walking is difficult, the patients are soon fatigued, drag their limbs, and are unable to stand upon one foot. In a more advanced stage, walking becomes increasingly difficult, painful, and finally, impossible. When the patient would stand, the sensation is as though the sacrum descended between the iliac bones, or as though the body would drop between the thighs. It is then quite possible by moving the lower extremities to perceive the motion of the ilia, and sometimes even a very sensible crackling or clicking can be detected. In one of M. Trousseau's patients the end of the forefinger could be readily inserted between the two pubic bones and a softened condition of the interarticular cartilage perfectly detected.

Relaxation of the pelvic symphyses is often greater after delivery than during gestation, and though more evident during the lying-in, is still often overlooked, and the pains which it occasions attributed to metritis or uterine displacement. In all these cases, however, the symptoms are the same and require similar treatment.

The prognosis is variable; in slight cases no treatment is required and the affection disappears after delivery. In a more advanced stage, rest in bed is insufficient, and an appropriate treatment becomes necessary. Sometimes three, six, or eight months, or several years, are required for the consolidation to take place. In one of M. Martin's patients the cure was postponed until after another labor. There are facts, indeed, which go to prove that relaxation of the symphyses may continue through life in spite of the best treatment. Finally, in the following article we shall speak of inflammation and suppuration of the symphyses, which may also occur and lend fresh gravity to the affection.

As soon as the relaxation is discovered, the patient should be put to bed and kept strictly at rest, with the pelvis held motionless by means of a compressory bandage. For this purpose a towel passed around the pelvis and drawn very tight, may answer in the simplest cases. The procedure is at once a rational treatment and a means of diagnosis, inasmuch as relief is generally immediate, and if successful, leaves no doubt as to the nature of the disease. Bandages of linen or ticking are, however, liable to stretch and loosen in a very short time, in which case a good substitute is found, according to Boyer, in a leather belt quilted internally and caused to surround the pelvis between the great trochanter and crest of the ilium and buckled in front. The best apparatus, however, is the one recommended and used by M. Martin. It is composed of a strong circular piece of metal two inches wide, open in front, and large enough to embrace the entire circumference of the pelvis. It is padded and quilted like the spring of a truss and provided at one end with a strong strap and with a buckle at the other, whereby the ends are brought together and held firmly. This apparatus has the advantage of being applicable during pregnancy without interfering with the development of the abdomen, and is even more useful after delivery. Although its weight is considerable, the patients soon become accustomed to its use. It secures immobility of the bones so fully that absolute quietness is no longer necessary, and the patients may walk every day without the recovery being interfered with.

"We owe," says M. Danyau, "the acknowledgment to M. Martin, that his belt fulfils all the indications, and that none other does so more effectually. Not only is it, like Boyer's, narrow enough to clasp the pelvis where the pressure can produce neither interference nor injury and be at the same time really effective, that is to say, between the crests of the ilia and the great trochanters, but what is not less important, it is so strong and stiff that when once applied and the bones brought in contact by it, separation afterward becomes impossible."]

When to relaxation of the pelvic articulations, inflammatory symptoms are added, they should be met by the appropriate means; in their absence, we may apply gentle pressure around the pelvis, and make use of some topical applications, general and local tonics, and astringent and resolvent lotions. After the total disappearance of the lochia, Desormeaux highly extols the employment of douches, sea-bathing, a good diet of nutritive articles, the Spa and Seltzer waters, wearing flannel next to the skin, and dry frictions. We cannot recommend too highly the use, in these cases, of the steel girdle of M. Martin, which, when tightly drawn around the pelvis, immediately restores a portion of its normal solidity, and facilitates the cure wonderfully.

These measures should be continued for a long time, and even when convalescence is fully established, the greatest possible care must be exercised in rising, walking, &c.

§ 2. INFLAMMATION OF THE PELVIC ARTICULATIONS.

Inflammation of the pelvic articulations, which is sometimes observed after labor, may also occur, though more rarely, during pregnancy. Drs. Hiller, Monod, Danyau, and Professor Hayn, of Königsberg, have mentioned instances of it.

The disease generally begins without appreciable cause, with sudden, acute, sometimes lancinating, though usually heavy pain, in one or several of the pelvic articulations. The pain is increased by pressure, standing, and especially by attempts at walking, which is sometimes altogether impossible.

These pains often extend into the lower extremities, and especially into the thighs. Swelling can sometimes be detected over the inflamed articulations.

These articular pains are sometimes attended by a febrile movement, which is occasionally severe, though generally quite moderate. In some cases, indeed, there is almost no general reaction.

The inflammation, when moderate, usually yields promptly to proper treatment; the cure is almost perfect after twelve or fifteen days, and the delivery and lying-in seem to experience no unfavorable effect from it. In some cases, however, whether in consequence of the intensity of the inflammation, or because the proper means were not employed with sufficient energy, the disease ended in suppuration, and in two instances proved fatal. In these cases, the articular surfaces were found denuded of cartilage. MM. Hiller and Monod mention two cases which proved fatal in this manner.

If the pains are very acute, and the general reaction decided, general and local bleeding may be employed at the outset. But when there is no fever, and the local symptoms are moderate, we may be content with resolvent applications, restricted diet, and absolute repose in the horizontal posture. Narcotics may be added to the resolvent applications, if the pains are too severe.

ARTICLE VIII.

DISEASES OF THE VULVA AND VAGINA.

[Various lesions of the vulva and vagina impede delivery, and are therefore discussed in the article on Dystocia. At present we shall describe only pruritus of the vulva, leucorrhœa, and vegetations, as they occur in pregnant women.

§ 1. PRURITUS OF THE VULVA.

Pruritus of the vulva, though not peculiar to, often occurs during pregnancy. It is characterized by intense itching of the external genital parts, the labia majora and minora, and often extends even into the vagina. The itching is irresistible, obliging the patients to scratch themselves, and thus, in consequence of the relief afforded, leads to a sort of masturbation.

Examination of the affected parts discovers no appreciable alteration: sometimes there is redness, at others some exudation of serum with superficial ulcerations reminding one of eczema. (Hardy.)]

The itching was so insupportable in a young married lady under my care, that she could not refrain from continual scratching, and the general irritation resulting therefrom almost threw her into convulsions.

In another instance, a young girl, who wished to conceal her pregnancy, was so tormented by this disease, that it was absolutely impossible to hide her distress from the observation of her family; and when I examined her, I found the internal face of the labia externa, and the nymphæ, both swollen and inflamed from the constant scratching; the nympha on the right side had been so long, and so strongly dragged upon, that it had acquired twice the usual length at least. Generally speaking, the frequent use of bathing, and of the vegeto-mineral lotions applied five or six times a day, will calm the itching; and as it is often greatly aggravated by walking, perfect rest is of course indicated. Some advantage is often to be derived from a fine compress dipped in oil of sweet almonds, and then placed in the vulvar fissure; or still better, if the compress be soaked in lead-water.

Dewees states that he examined a young lady who complained of this excessive itching in the genital parts, and he found the internal face of the vulva, as also the inferior part of the vagina, covered by numerous aphthæ; and that the application of a strong solution of borax, four or five times a day, caused them all to disappear in the course of twenty-four hours.

Dr. Meigs has always found the following preparation useful:—

℞—Borax, ...	ʒij.
Sulph. of morphia, ...	gr. ivss.
Dist. rose water, ...	f℥viii.

Apply three times a day to the affected parts, by means of a sponge or piece of linen, taking care to wash the parts beforehand with soap and water, and to dry them well afterwards. The following solution of bichloride of mercury may also be used with advantage: Add a drachm and a half of corrosive sublimate to four ounces of distilled water, and of this solution let the patient add a dessert-spoonful to a pint of *very warm* water, and use for injections and lotions. Hot water alone will answer in many cases. (Trousseau and Pidoux.)

[Pruritus of the vulva is often very obstinate. In the rebellious cases mentioned, M. Dubois advises that the entire mucous surface of the vulva be cauterized with the solid nitrate of silver. A great objection to it however is, that it is extremely painful and almost always produces but temporary alleviation. We have generally succeeded with a solution of corrosive sublimate, as follows:

℞.—Bichloride of mercury, ...	gr. xxxi.
Alcohol, ...	fʒiij.
Rose water, ...	f℥iss.
Distilled water, ...	f℥xv.

This is used as a wash, undiluted, morning and evening, as follows: After using warm water for the purpose of removing mucous secretions from the vulva, and drying the parts well with a piece of fine linen, a small sponge saturated with the fluid is passed rapidly over the entire itching surface, so as to moisten it thoroughly. A smart burning sensation is the first effect of the application, which is alleviated by a few minutes washing with cold water. Subsequent applications are less and less painful, and the cure is generally rapid. We prefer this treatment to all others.]

§ 2. Leucorrhœa.

We shall limit ourselves to a short notice of the profuse leucorrhœa with which women are very often affected during pregnancy. This discharge, which is sometimes white and sometimes of a yellowish-green color, usually makes its appearance during the second half of gestation, though I have seen some persons affected with it from the early months. It is generally coincident with the development of numerous granulations, which, as we have already said, sometimes cover the vaginal mucous membrane, and constitute what has been described of late as *granular vaginitis*. When it is very profuse, an examination by the speculum frequently discovers numerous ulcerations of the neck of the uterus. We shall have occasion to speak of these ulcerations hereafter. I am convinced that the vaginal granulations and ulcerations of the cervix are very rarely as serious during gestation as they appear to be under some other circumstances, since they generally disappear with the pregnancy, during which they are developed.

Sometimes the discharge is so abundant as to react upon the functions of the stomach, and I have seen several patients with symptoms of gastralgia, evidently connected with the leucorrhœa, inasmuch as they increased or diminished according as the latter was more or less profuse.

This affection often produces, in addition, great irritation, a burning heat, and sometimes an almost insupportable itching of the lower part of the vagina and external genitals. A profusion of small vesicles appear upon the internal surface of the greater and lesser labia, which, by constantly rubbing against each other, finally give rise to excoriation, and render walking very painful.

Frequent baths, lotions, and injections of cold water, to each quart of which a dessertspoonful of subacetate of lead has been added, repeated several times daily, according to the degree of pain, are the best remedies. It will also be found advantageous to separate the parts, by introducing a piece of fine linen between the labia, so as to prevent friction whilst walking. It is unnecessary to say that the introduction of the speculum during pregnancy requires that especial care be taken not to press it too far.

Though the patient's sufferings may easily be alleviated in this manner, it is more than probable that the granulations will continue, and that the discharge will not cease entirely; in spite of all that can be done, it generally lasts until the end of pregnancy, and in the great majority of cases only terminates after delivery.

[Would any disadvantage attend the insertion in the vagina of tampons formed of carded cotton and alum? Would they be likely to occasion abortion or premature delivery? During my present temporary service at the Lourcine hospital, I have found quite a number of pregnant women affected with vaginitis and profuse leucorrhœa, and in all such cases it is the practice there to use the above-named tampons, notwithstanding the fact of pregnancy. I continue them as they have been used heretofore, though not without apprehension; still no accident has occurred as yet. I should desire, however, a longer experience, before I could feel willing to advise them.

Vaginal injections, especially if used indiscreetly, may excite contraction of the uterus and abortion, if the fluid be thrown upon the os tincæ.

§ 3. VEGETATIONS.

The external parts of generation, particularly in women affected with blennorrhœa, vaginitis, or uterine catarrh, often become covered with vegetations, which were long supposed to be of a syphilitic character. They seem always to be connected with the presence of a discharge in non-pregnant females; that their production may also be favored by pregnancy, is a fact established, as I think, by the treatise of M. Thibierge.

The vegetations may appear in pregnant women at any period of gestation. They consist of tufts of a rosy hue, attached by a pedicle, and spreading out like a cauliflower. In respect to number and size they vary greatly.

They may be either scattered or so grouped as to form large masses. A patient in the Hospital of the Clinic had them in the form of a tumor as large as the fist.

They affect more especially the mucous membrane of the vulva, though they also form on the external surface of the labia majora, in the furrow between the buttocks, about the region of the anus and the genito-crural folds: sometimes, even, they sprout from the walls of the vagina or the os tincæ, though in these situations they are generally small.

They are attended with itching, considerable pain, and a discharge. They also exhale a very unpleasant odor, but are really devoid of danger, and occasion no obstruction to delivery, even when of large size. In the majority of cases they disappear spontaneously after delivery; the pedicle dries up, and they fall like a ripe fruit. This favorable termination is not, however, universal.

One of their peculiarities is that of continuing to sprout during gestation in spite of all kinds of treatment. Still, M. Thibierge thinks that the use of local applications during pregnancy may dissipate them when small and few in number. Under other circumstances they are almost certain to return.

In regard to treatment during pregnancy, an attempt may, in the first place, be made to destroy them by local applications, as of alum, nitric acid, or the acid nitrate of mercury applied drop by drop. Excision, and even crushing, are liable to occasion obstinate hemorrhage, so that radical operations ought not to be performed. After delivery, should the trouble persist, any of the methods of treatment used in such cases become applicable.]

ARTICLE IX.

ABDOMINAL AND UTERINE PAINS.

Beside the numerous functional disorders just studied, some pregnant women suffer, in various parts of the body, pains whose intimate cause is imperfectly understood, and to which they sometimes call the attention of the physician. Some of these pains appear to be seated in the abdominal parietes, the lumbar region, the groins, and the internal part of the thighs; others, again, appear to affect more especially the walls of the uterus, or the annexes of that organ.

§ 1. Abdominal, lumbar, and Inguinal Pains.

These pains, which are sometimes confined to a quite limited space of the abdominal parietes, do not often appear before the latter months of gestation. They are frequently felt at the lower part of the breast, near the upper insertions of the abdominal muscles, or, less often, in the inguinal folds near their inferior attachments. The pains are much increased by motion, the least pressure, and sometimes, also, by the movements of the child, if violent. As already stated, they are generally limited in extent, sometimes not affecting a space larger than a silver dollar, the parts surrounding being entirely free from pain.

Since lumbar and inguinal pains, occurring in the first half of gestation, may be the preludes of an abortion near at hand, they claim special attention. At this early period they are almost uniformly the sympathetic expression of uterine disorder, itself due to a local congestion, though perhaps still oftener to a special irritability of the womb. They then resemble precisely the lumbar and inguinal pains which are so often experienced by young girls affected with dysmenorrhœa or amenorrhœa, and are effectually overcome by opiates, small revulsive bleedings, and sometimes also, in very nervous women, by warm bathing. If, as is often the case, the pains seem to be increased by sexual intercourse, too long a walk, or riding in a carriage, it were useless to say that abstinence from all these causes, and repose in the horizontal posture, are the first indications to be fulfilled.

These pains most commonly appear toward the end of pregnancy, but their cause, that especially of the lumbar pains, is very obscure. Sometimes, however, it can be ascertained that they are seated in the pelvic articulations (see page 515). Dragging upon the broad ligaments, compression of the lumbar nerves, extreme distention of the uterus, and engorgement of the pelvic and uterine vessels, have been successively adduced in explanation; but though the relief obtained from bleeding, in some cases, would seem to show that they might sometimes be caused by local plethora, there is no evidence of any such influence as is attributed to the other causes mentioned.

The inguinal pains have generally been referred to traction upon the round ligaments. I do not say that this traction may not produce them, but I am convinced that toward the end of pregnancy they are oftener due to the pressure of the uterus upon that region, in the vertical as well as in the sitting posture. They generally disappear, indeed, in the horizontal position, and the best means of relieving the patients is to support the abdomen, and at the same time raise it a little by means of a well-made corset, or of a large abdominal belt, the central portion of which embraces the sub-umbilical region, and whose two ends are attached to the back part of the corset.

[Having for some time made a special study of these abdominal, inguinal, and lumbar pains, we are convinced that very often they are due to neuralgia of the cutaneous nerves from the collateral branches of the lumbar plexus. To be assured that such is the case, it is only necessary to test carefully the sensibility of the skin in these regions, either by rubbing it rudely with the end of a pencil, or by raising it in the form of a fold which is to be gradually pinched between the fingers. Pressure ought also to be made all along the crest of the ilium in the direction of the genito-crural nerve. Should we be satisfied with merely questioning the patients, or depressing the walls of the abdomen by the hand, we would incur the risk of obtaining very little information, or of suspecting the existence of a deep-seated visceral pain when the skin only is affected. This mistake, which we see committed every day, would be avoided by taking the trouble to make the above-mentioned examination, and we cannot recommend it too highly.

The principal parts affected by this neuralgia are the lumbar, iliac, hypogastric, and inguinal points, though the pain may appear in some other portion of greater or less extent of the skin of the abdomen. Sometimes confined to a circumscribed point, it occasionally invades an entire half of the abdominal walls. It very rarely affects both sides at the same time with equal intensity.

The local application of narcotics constitutes the treatment *par excellence*, of these neuralgic pains. We have almost always succeeded with very small blisters sprinkled with one of the salts of morphia. Subcutaneous injections are also clearly indicated, and none of these methods are liable to effect unfavorably the course of the pregnancy.

What we have just written applies especially to the abdominal neuralgia of pregnant women; but before leaving the subject, we desire to say that the same affection is also extremely common after delivery. In the latter case, however, instead of being the chief pathological element, it is almost always symptomatic of a lesion of some one of the pelvic organs. Its investigation is not, on this account, less important, because, generally, the intensity of an inflammation is estimated by the acuteness of the pain which it produces. Under these circumstances, if the skin be raised carefully between two fingers, and the fold thus formed be pinched, it is often found that the pain is seated partly in the skin and not in the uterus or its appendages. The physician is thus better informed, since a slight metro-ovaritis may be attended by a violent cutaneous neuralgia more alarming by far than dangerous.

The lumbo-abdominal neuralgia which is symptomatic of a metro-ovaritis or of a metro-peritonitis, also enables us to understand certain facts which would be inexplicable without it. Suppose a newly delivered female to be attacked by metritis; the uterus is examined by depressing the walls of the abdomen by the hand, and several examinations carefully conducted assure us that pain is produced about the fundus of the organ. The usual treatment in such a case consists in the application of leeches directly over the seat of pain, and, we must say, almost always affords relief. Is it not surprising that such a result should be produced? How could we suppose that an abstraction of blood from the skin of the abdomen near the umbilicus would act directly upon the fundus of the uterus when all vascular communication between the two parts is prevented by the interposition of the peritoneum? We bow before the facts, yet believe that the bites of the leeches, when they afford relief, do so by acting directly upon the cutaneous neuralgia which is symptomatic of the metritis, and have no effect upon the vascular engorgement of the uterus. The same result would follow the application of a blister dressed with a salt of morphia. As soon as time shall permit, we intend publishing several cases which go to prove what we have just said respecting the part played by lumbo-abdominal neuralgia during pregnancy and in the diseases of lying-in women.]

The pains in the internal parts of the thighs, the numbness and cramps of both legs, though more commonly of one only, are usually attributed to pressure of the head on the lumbar and sacral nerves. But, as Tyler Smith remarks, since they mostly occur at night, when the women are in the horizontal posture, or whilst they are sitting, in both which positions the pressure should be much less than whilst standing, it seems very probable that compression of the nerves is not the cause. Perhaps we may accept the idea of the English accoucheur, that, like the corresponding affections in cholera, they are connected with some irritation or difficulty of the large intestine, or with a morbid condition of the uterus. It would not be the only instance of visceral irritation producing spasmodic contraction of the muscles of animal life by reflex action.

According to this hypothesis, the best means of preventing the recurrence of the cramp is to keep the bowels free, and allay the irritability of the womb as much as possible by baths, opiates, &c. The surest means of counteracting it is to contract voluntarily, the very moment it appears, the antagonistic muscle of the affected one; thus the thigh should be strongly extended when the flexor muscles are contracted, and the foot should be flexed on the leg when the cramp affects the muscles of the calf.

§ 2. UTERINE PAINS.

1. Beside the uterine pains which sometimes accompany the outset of a disordered pregnancy, also beside those which seem to herald the approach

of labor in the latter weeks of gestation, females experience, at variable periods and intervals, pains which are sometimes very acute, and evidently seated in the walls of the uterus itself. It is impossible to determine the cause and nature of these pains; for though they may be attributed, in some rare instances, to partial spasm of the muscles of the uterus, or to a more or less extensive inflammation, most frequently nothing of the kind is to be discovered. Sometimes they are limited to a single circumscribed point, whilst at others they affect the entire womb. In the first case they are continuous; in the second, they are irregularly intermittent, and their recurrence, or rather their paroxysm, appears to coincide with a motion of the female, pressure upon the abdomen, an attack of coughing, or sudden movements of the child. At the same time the uterine tumor may almost always be felt to become denser and harder: in short, a true contraction takes place, which continues as long as the paroxysm lasts. If, struck with this condition of the body of the womb, an examination be made *per vaginam*, the cervix will be found unchanged, having undergone no alteration which could excite solicitude on account of the long-continued previous contractions. Usually, there is very slight general reaction, and little or no fever.

When the pain is both circumscribed and moderate, emollient and narcotic applications may be found sufficient; but when more severe, it will be necessary to prescribe the most absolute repose, injections with camphor and laudanum, baths, maniluvia, and even bleeding from the arm. It generally yields to these measures when properly employed, though, unfortunately, it returns with some individuals very frequently. I have, at this moment, a young lady under care, who is at the eighth month of her pregnancy, and who has had five attacks within three months, two of them lasting for twenty-four hours. The first time she was bled; but as her general condition seemed to contraindicate a repetition of this measure, and she was very averse to bathing, I was obliged to content myself with prescribing rest and opiate injections. Now, there is every prospect of her reaching her full term.

2. The sensibility of the uterus is sometimes singularly increased by constant and violent motions of the fœtus. Some children, indeed, seem endowed with such activity that they are hardly ever quiet, and their continual movement becomes a cause of irritation to the womb, which, by reacting upon the whole economy, may produce insomnia, general excitement, and nervous and sometimes even convulsive movements. I have seen two instances of these disordered motions of the child; especially was it marked in the case of the wife of one of my professional brethren. This poor lady was delivered at term, notwithstanding she had been almost entirely deprived of sleep during the eighth and ninth months. Burns says, that patients under these circumstances are delivered rather before the ninth month. The bleeding and opiates which he recommends may indeed lessen the irritability of the uterus, but evidently can have no power to diminish the activity of the motions of the child, which is the first cause of the uterine pains.[1]

---

[1] Dr. Tyler Smith endeavors to show, in a very interesting memoir, that the active motions of the child amount to almost nothing, and that the sensations perceived by

3. Some authors state that metritis, or metro-peritonitis, are possible during pregnancy, but they are so rare that it has never fallen to my lot to see them. Besides, they seem to me to belong to the same category as all the acute affections which may arise during pregnancy; and though the usual gravity of the prognosis be heightened by the condition of the female, the treatment would be the same as after delivery.

§ 3. Rheumatism of the Uterus.

Rheumatism of the uterus, although studied for a long time in Germany, was scarcely known in France, until M. Dezeimeris published in his journal (*l'Expérience*) a series of facts that were previously known to, and put forth by, the German authors. About the same time, M. Stoltz, who was acquainted with the works of our neighbors on the subject, devoted particular attention to this affection at the Clinical Hospital of Strasbourg, and communicated the result of his observations to his pupils. One of them, Dr. Salathé, has quite recently defended a thesis on this subject; and from his work, as also from the bibliographical researches of M. Dezeimeris, I extract the following account of this disease, which is unknown to French nosologists.

According to Radamel, rheumatism may attack the uterus in the non-gravid state; but we have only to study it here as occurring in pregnant females, in whom it may appear at all stages of the puerperal condition. Therefore, after some general remarks on the disease itself, it will be necessary to point out the influence that it may have over the gestation, the parturition, and the lying-in.

Causes.—Every circumstance calculated to favor the development of the rheumatic affections in general, may likewise prove a source of rheumatism of the uterus: thus, a momentary or a prolonged exposure to cold and moisture, inadequate clothing, or sudden changes from a very high to a very low temperature, and all those other atmospheric constitutions which have been enumerated by medical authors, either as predisposing or as determining causes of rheumatism, may likewise produce that of the womb. But, besides these general causes, there is one peculiar to the disease under consideration; that is, the susceptibility of this organ to the impression of cold under the attenuated integuments of the abdomen during the latter months of gestation; for the belly is only covered at that particular point by very light clothing, which is far from fitting closely, and the lumbo-sacral region is often but imperfectly protected by the short jackets worn by the patient.

Symptoms.—Rheumatism of the uterus very often occurs in persons who are constitutionally predisposed to the rheumatic affections; and it may coexist with a general disorder of the same nature, though in the majority of cases the womb, together with its appendages and the adjacent parts, is alone affected. Again, it has oftentimes resulted from a sudden cessation

---

the mother and accoucheur, hitherto attributed to the muscular contractions of the child, result simply from partial contraction of the muscular fibres of the uterus. Notwithstanding the seductive character of the reasons adduced by Dr. Smith, we hold to the generally received opinions, though entirely disposed to think that the views of the English accoucheur may be applicable to the exceptional cases of which we are speaking.

of a rheumatic pain at some other point, which is speedily transferred to the uterus. But, whatever may have been the mode of its attack, this disease exhibits some well-marked peculiarities, by which it can easily be recognized. The principal symptom is pain, or a distressing sensation, which involves the whole, or a part of the womb, without any violence having been exerted on the organ; its intensity varies from a simple feeling of heaviness to the most painful dragging sensation; and it may occupy either the entire womb, or only one of its parts, such as the body, the fundus, or the inferior segment. When the rheumatism is fixed in the fundus uteri, the pain is particularly apt to be felt in the sub-umbilical region; it is augmented by pressure, by the contraction of the abdominal muscles, and sometimes even by the simple weight of the bedclothes; and in many cases the patient is unable to bear any movement whatever. If seated somewhat lower, she suffers from acute dragging sensations, that run from the loins toward the pelvis, the thighs, the external genital organs, and the sacral region, along the uterine ligaments. Finally, when the inferior segment participates in the affection, the seat of it can be detected by the vaginal exploration, which gives rise to the most acute sufferings. But, of all the causes that may exasperate these pains, there are none more distressing than the incessant movements of the child.

Like all rheumatic pains, those of the uterus are metastatic, and they occasionally pass rapidly from one point of the organ to another; often, indeed, they disappear at once, and pass off to some other organ. This is particularly apt to occur when the pain was originally located at some other point, and measures have been employed to recall the affection to the part primitively attacked.

They present frequent and variable exacerbations in their duration and intensity, according to the stage of the disease; sometimes they are followed by remissions, during which the patient experiences only a vague sensation of weight in the part. The uterine pains are usually accompanied by a recto-vesical tenesmus, which is the more distressing as the former are the more energetic, and are seated near the inferior segment. The patient is then tormented by a continual desire to empty her bladder; the emission of urine is attended by a smarting sensation, and sometimes by acute sufferings, while at others it is even wholly impossible; and in many cases the attempts to move the bowels prove equally ineffectual. Most of the German authors attribute this double recto-vesical tenesmus to a rheumatic affection that is not always exclusively limited to the womb, but which also invades the neighboring organs. But M. Stoltz appears disposed to believe that it is rather the result of the close sympathy existing between these adjacent parts; for, if these new pains were occasioned by a rheumatism of the rectum or bladder, those of the uterus ought to disappear altogether, or at least should be diminished. (*Salathé's Thesis.*)

Analogy would lead us to suppose that an unusual heat and tumefaction must exist in the affected parts; but the difficulties in detecting these characters are self-evident, although their existence is quite probable.

Such acute pains, seated in so important an organ, would naturally produce considerable general reaction; and it is found that this disease, like the greater number of the inflammatory affections, most usually commences by a slight chill, which lasts for a quarter of an hour or twenty minutes; the fever that follows it diminishes, and sometimes disappears altogether, during the interval between the paroxysms; but, pending their duration, it is usually quite intense, the pulse is frequent and hard, the face excited and flushed, and the tongue is red and dry; the patient complains of thirst, the skin is hot, and she often suffers from an extreme agitation and restlessness. Towards the end of the paroxysm, a profuse perspiration generally breaks out, which seems to be the prelude of a notable amelioration. Then these general phenomena become moderated, together with the uterine pain, but they reappear with the latter, after a variable period, ranging from a few hours to several days.

1. *Influence of Rheumatism over the Progress of Gestation.*—The paroxysms are apt to be followed by uterine contractions in those cases in which they have persisted for some time, or have been very severe; and in this manner they may serve to bring on a premature delivery. The patient experiences some acute and tensive pains, but this feeling of tension is not uniform; for it attains, in turn, a high degree, and then becomes weaker in the same proportion, progressing in this way with shorter and shorter intervals. At first the uterus is indurated to a partial extent, but afterwards throughout; the os uteri dilates, though its dilatation is at first slow and difficult, and its ulterior progress does not seem to correspond with the intensity of the pains. An abortion is then imminent, but it is far from being so frequent as might be supposed; and when it does occur, it is more frequently observed in the febrile than in the apyretic form of rheumatism. The orifice has been known to dilate to the extent of an inch in diameter, and then the bag of waters, that had previously engaged in this opening, insensibly retreated, the os uteri again closed up, and the delivery did not take place. Consequently, so long as the dilatation of the os uteri does not amount to two inches, we may reasonably hope to make the labor retrograde. These uterine rheumatic pains may simulate those of parturition, and thus lead the accoucheur to suspect that labor has regularly commenced, when in fact such is not the case. The characters of the rheumatic pain, furnished in the following paragraph, will aid in preventing such an error. It is probably to some mistakes of this kind that we must refer those pretended instances of prolonged gestation, as well as those cases in which genuine labor was developed, and afterwards suspended during several weeks, and even months.

2. *Influence of Rheumatism over the Labor.*—As a general rule, a rheumatic affection of the womb retards the progress of the labor, and sometimes even renders the spontaneous expulsion of the child wholly impossible. Besides the general phenomena already pointed out, the disease here gives rise to the following peculiarities:

1st. It is well known that the normal uterine contraction only begins to be painful when it has accomplished the greater part of its course, and when it is at the point of distending and dilating the uterine orifice; in other words, the true labor-pain only commences at the instant when the power of the body of the womb overcomes the resistance of the neck. In rheumatism, on the contrary, the uterine contraction is painful from the very first, and prior to any action upon the cervix; hence the cause of the pain is not in the violent distention of this orifice, but rather in the uterine contraction itself, in the other morbid conditions, and in the altered relations of the nerves and contractile fibres of the uterus.

2d. In a normal labor, the contractions begin at the fundus, and terminate at the inferior segment of the womb; in rheumatism, instead of starting at the fundus, they begin in the painful point, and are not regularly propagated towards the cervix. Again, the rheumatic pains exist prior to the contraction of the womb, and then speedily acquire a high degree of intensity under the influence of this latter. At times their violence promptly arrests the contractions, even before they have traversed their ordinary cycle. They are then rapid, short, and become more and more distant.

3d. Towards the end of labor, at the time when the uterine action ought to be aided by the voluntary contraction of the abdominal muscles, the woman refrains from exerting these under the fear of augmenting the pains, whereby an excessive slowness in the labor results. The patient is found in a state of extreme anxiety, and the frequency of her pulse, the heat of the skin, the thirst, and vesical tenesmus, are all greatly augmented. Where these sufferings are much prolonged, she falls into a state of swooning, which often proves serviceable, as the pains are suspended while it lasts; a profuse perspiration has then been observed to take place, which had the most salutary influence over the ulterior progress of the parturition. But at other times the uterus becomes more and more painful, and it is rather in a state of permanent contraction, or of fibrillar vibration, than of normal contraction; the pulse is accelerated, and the woman is affected with a metritis which renders the labor extremely painful.

3. *Influence of Rheumatism over the Puerperal Functions.*—The reader will anticipate from the foregoing, that rheumatism of the womb may prove a source of difficulty in the delivery of the after-birth, by determining irregular or partial contractions of the organ immediately after the expulsion of the child; but that subject does not claim our attention at the present time, and it will be reverted to hereafter. In the healthy state, the uterus retracts after the delivery, and thereby prevents the development of hemorrhage. But in rheumatism, this retraction of the organ is very imperfect, and it remains much larger than usual; the after-pains are then very distressing, and are prolonged for some time; the uterine vessels are less compressed than usual, and profuse floodings may thence result. On the other hand, the suffering state of the organ diminishes both the lochial discharge and the lacteal secretion; and this, together with the persistence of the abdominal pains, and a manifestation of the phenomena of general reaction, may be mistaken for a peritonitis which does not really exist.

Prognosis.—Rheumatism of the womb is not a disease capable of determining the loss of the mother's life; nevertheless, from the pain that it occasions, and the errors it may give rise to in practice, it does not the less merit a careful study; because, during pregnancy, it may prove to be a source of abortion, and though it is not often manifested until after the sixth month, yet it is always an unfavorable circumstance to the child to be born before term. We have already spoken of the unfortunate influence it may have over the course and character of the labor-pains; in fact, it has often rendered an artificial delivery imperative. It may also complicate the delivery of the after-birth, and disturb the order of the phenomena that constitute the lying-in. At that period it has often been mistaken for true inflammatory symptoms, and, consequently, has been combated by measures that were more dangerous than useful.

As regards the period of manifestation, it is generally more unfavorable when it occurs at an early stage of the gestation; both because it then has a greater influence over the pregnancy, which has not become firmly established, and because it has a tendency to return several times before term. Besides which, most women, who have been affected during the gravid state, likewise find it to reappear again in the course of parturition, which is thereby rendered laborious.

Treatment.—1st. The measures that have most frequently been attended with success when administered for this disease during the gestation are: general venesection; the intestinal revulsives, such as castor-oil and ipecacuanha; bathing, narcotized lotions over the abdomen, opiated mixtures, and sudorific drinks; and in those cases in which the uterine affection had succeeded the sudden disappearance of a rheumatic pain in some other organ, the application of revulsives over the part primarily affected. 2d. During the labor, the same means are employed; but if they fail, and the degree of dilatation of the os uteri be such as to permit an artificial intervention, either the forceps or version should be resorted to, according to circumstances. 3d. After the delivery, sudorific drinks, opiated unctions over the belly, and baths; and when the lochial discharge has failed, leeches to the vulva, and ipecacuanha combined with opium.

ARTICLE X.

OF DISPLACEMENTS OF THE UTERUS CONSIDERED IN REFERENCE TO THE ACCIDENTS THEY MAY CAUSE DURING PREGNANCY.

§ 1. PROLAPSUS OF THE UTERUS.

We have already seen, in studying the situation of the uterus at the different periods of gestation, that at first this organ sinks lower in the excavation, and that its orifice approaches the vulva. Now this first degree of depression may be considered as physiological, but it cannot pass beyond that without giving rise to some accident or other. Hence, laying aside all causes foreign to pregnancy, the uterus descends the more in the earlier months of gestation in proportion to the larger size of the pelvis, and the greater relaxation of the ligaments. In some women it rests on the floor of the pelvis, whilst in others, the neck, or even the body, may protrude through the vulva and become visible externally.

We see, therefore, that either a simple descent or an incomplete or complete prolapsus may occur during pregnancy, as well as in the non-pregnant condition. The complete prolapsus, that in which the entire body of the uterus is external to the genital parts and hangs between the thighs, is extremely rare. It were wrong, however, to deny its possibility, since this is proved by a case reported by Vimmer.

displacements may occur either slowly or suddenly, though the
ay have had nothing of the kind previously; sometimes, however,
but the continuation or exaggeration of a pre-existing prolapsus.
h the progressive development of the uterus generally removes the
te prolapsus about the fourth or fifth month, by causing the organ
bove the superior strait, the displacement, in some cases where the
spacious, may continue, and even increase, notwithstanding the
of gestation. I have, quite recently, had under care at the Clin-
ery remarkable case of incomplete prolapsus, in which the entire
the uterus projected beyond the external parts, the whole excava-
ng occupied by the lower part of the body distended by the fœtal
The displacement continued until delivery without any serious acci-
ervening.[1] It had existed for several years.

ollowing are some of the details of this interesting case: Marie ——, aged
ven years, entered the hospital October 18th, 1849. She was then at the
of the ninth month of her pregnancy. Four years previously, she became
for the first time, and when near delivery, she both felt and saw a small red
about the size of a walnut, escape through the vulva. It projected but
incommoded the patient but little, and did not interfere with the labor at all,
latter was accomplished quite rapidly. After her confinement, she continued
same tumor, less prominent, indeed, than during pregnancy, projecting and
ing according as she was quiet or took long, fatiguing walks. Under the
cumstances she suffered much from sensations of dragging in the groins and
t of the thighs. She was habitually and obstinately constipated, and some-
great difficulty in urinating.

ars ago, the same person became pregnant the second time, and during the
months the tumor became gradually more projecting, and hung very low,—
e says, that a midwife, after having returned the parts, applied a pessary,
oduced discomfort, and was retained but two days. Eight days after the
ion of the pessary, she miscarried, at about three months and a half to four
The midwife who attended her could not extract the placenta, and, two days
s, a physician endeavored to deliver it, first with the hand, and afterwards
ps, but could obtain only some fragments.

overed entirely; the tumor remaining within whilst quiet in her chamber,
ring externally after much walking.

ng pregnant for the third time, the tumor did not incommode her much more
l during the first three months, but after the fourth, it projected much more
ulva, and towards the last three months it was impossible to restore it for
ys, even after observing the most absolute repose in bed. At present, the
ing eight months and a half gone, the following may be observed:

drical tumor, two inches in length, projects from the vulva; it is five inches
ference, and rather larger and harder at its lower than at its upper extrem-
xternal surface is marked at the union of the two upper thirds with the lower
vhitish circle, dividing two surfaces of different color and appearance. The
s of a rosy hue and smooth, being only the internal surface of the vagina
rom above downwards, which thus forms the external surface of the tumor.
or portion is of a deeper red color, and presents wrinkles or folds, directed
e downwards, and from within outwards, and separated on the median line
ntly longitudinal fibres. These folds are merely the arbor vitæ of the neck
rom below upwards, so that the internal surface of the cavity of the neck
e a part of the external surface of the tumor to the extent of five-eighths of
The somewhat swollen lower extremity of this tumor presents an opening,
kled edges, resembling the drawn mouth of a purse, and into which the

In some cases the displacement increases considerably, and either as an effect of its own weight, or in consequence of exertion or violent exercise, the lower part of the body of the uterus projects beyond the vulva, the upper part of the organ being still within the pelvis.

finger enters with ease. This is the cavity of the neck, forming a canal two inches and three-quarters in length, through which the membranes and a hard body, recognized as the head of the fœtus, may be felt. The internal orifice is quite largely dilated, that is, nearly to the size of a one-franc piece. The entire head is discovered to be in the excavation, and altogether behind the symphysis pubis, by which it seems to be arrested.

If it be attempted to enter the vagina, at the same time traversing the circumference of the upper part of the tumor, a cul-de-sac is reached at a depth of from two inches and three-quarters to three inches and a quarter on the sides, from two and a half inches to three inches and a quarter behind, and from only two to two and a half in front, when the examination is stopped by the walls of the urethra, which are thickened and curved, as it were, posteriorly.

This cul-de-sac is formed by the vagina turned inside out from above downwards; and any effort to push it upwards is soon arrested by the fœtal head, which is plunged into the excavation, and rests upon the floor of the pelvis.

The patient suffers from obstinate constipation, and sometimes only from difficulty in passing urine, which escapes by jets.

To recapitulate, we find: 1. A descent of the womb, which seems to be retained in the pelvis only by the floor of the latter, and the pubic arch and symphysis, against which it rests; the rectum and urethra are also compressed. 2. Prolapsus of the neck of the uterus outside of the vulva, carrying with it the vagina, which covers its upper part like the inverted finger of a glove, and which is itself inverted from below upward to the extent of five-eighths of an inch, so that its internal surface forms the external surface of its lower extremity; this extremity of the neck forms the expanded and wrinkled portion of the tumor. 3. Constipation and difficulty in urination caused by pressure.

The tumor increased about three-quarters of an inch in size, from the 20th of October to the 3d of November; but its volume was much greater in consequence of the œdematous condition of the prolapsed parts.

After some fruitless efforts to reduce the prolapsus, I concluded that it would be best not to try any further, but to limit treatment to evacuation of the bowels by mild laxatives, — the patient being unable to receive enemata, — a bath every two or three days, and frequent lotions and injections. Assisted by the horizontal posture, these measures completely relieved the patient of her sufferings.

At noon on the 3d of November, the waters came away without pain, after efforts at defecation. The internal orifice of the cervix was of the size of a one-franc piece; the neck was rather longer than before the 3d, and rather softer. During the last ten days the patient felt her abdomen become harder from time to time, but without experiencing the least pain.

From noon until 10 P. M. the pains were very weak and distant. From 10 o'clock to 3 A. M. (of the 4th), they became greater, more powerful and frequent. Finally, the labor terminated at 3 A. M. the 4th of November, after a labor of fifteen hours, if the time be reckoned from the rupture of the membranes and discharge of the waters, and only of five hours, if counted from 10 P. M., at which time there was no change in either the length or dilatation of the neck, though then it was that the pains became well marked and regular.

The following are the principal phenomena which accompanied the expulsion of the fœtus: At the commencement of labor, the neck remained external precisely as before, and when the head came to be expelled, it dilated visibly, and was the last obstacle which this part had to overcome. No resistance was offered by the vulva, which was traversed before the external orifice of the neck of the uterus.

The disorders resulting from this displacement vary in intensity according to its extent and the stage of pregnancy at which it occurs. When the pelvis is too spacious, the excess of size affecting chiefly the excavation, whilst the straits preserve their normal dimensions, the uterus may remain much longer in the lesser pelvis than is usual in well-formed women. It then incommodes the neighboring parts, pressing upon and irritating the rectum and the bladder; the patient suffers from a feeling of weight at the anus, and painful tractions in the groins, lumbar regions, and umbilicus. A more or less abundant and fetid discharge also comes on; the woman can neither stand nor walk without suffering, and she falls gradually into a state of marasmus.

When the gestation is more advanced, and the womb increased in size, or even if less voluminous, but more depressed, the symptoms, such as complete retention of the urine, very obstinate constipation, &c., are still worse; finally, the pressure of the uterus on other organs may react on itself, and the consequent irritation thus prove a cause of abortion.

When the retention of the urine is complete, either the catheter should be at once resorted to, or the womb be pressed up by one or two fingers previously introduced into the vagina; but even this assistance will not be necessary, if the woman lies down and elevates her hips considerably whenever she wants to urinate. All these symptoms, however, disappear about the fifth month, when the uterus, on account of its great development, can no longer remain in the excavation, and therefore rises above the superior strait.

In cases of simple and incomplete prolapsus, some authors recommend the introduction of a pessary, in order to sustain the uterus, and prevent its prolapsing completely. I regard the pessary as always useless and often dangerous. Rest in bed, and proper cleanliness, seem to me capable of preventing the precipitation of the organ, and of alleviating the painful irritations which the displacement produces.

Certain instances of success seem to authorize attempts at reduction in cases of incomplete and complete prolapsus occurring at an advanced stage of pregnancy. In both circumstances, I think that these attempts should be moderate, since they appear to me likely to compromise the gestation. When the prolapsus is complete, the danger to which the woman is exposed

The child, which was a male, was born alive. Its weight and dimensions were as follows:

Weight,	5½ lbs. (Troy).
Total length,	1 ft. 6 inches.
From the crown to the umbilicus,	9 "
From the umbilicus to the heel,	9 "
Occipto-frontal diameter,	4 "
Occipito-mental "	5 "
Bi-parietal "	3⅜ "
Sub-occipito-bregmatic diameter,	3½ "

The day following the labor, the cervix projected to the same extent outside the vulva, and the parts were rather more flaccid; the engorgement being dissipated, the neck was returned within the vagina; the patient continued in the horizontal position, and a month after left the Clinique without the neck having appeared at the vulvar opening.

by the nature of the displacement itself would certainly authorize rather greater perseverance; but it is easy to see that in the latter months it will rarely be possible to return the uterus within the pelvis.

When the reduction is impossible, the uterine tumor should be supported by a proper bandage, and the female confined to the horizontal position.

In women who have had a falling of the womb before impregnation, there is reason to fear that it may persist and augment during the first three or four months of gestation, in consequence of the great laxity of the ligaments; and it is therefore prudent to advise such persons to keep the horizontal position during all this time, and not to permit them to get up until after the fifth month. After the delivery, they should again remain in bed six weeks or two months at least; for by such precautions, not only may the patient escape the dangers attendant on a prolapsus uteri during the earlier periods, but sometimes even a radical cure of the disease she had before the gestation took place may be effected.

§ 2. RETROVERSION.

The mobility of the uterus in the pelvis, which is still observable in the early stages of pregnancy, notwithstanding its augmentation in volume, exposes it to another variety of displacement, that is not so common as the preceding, but more disastrous in its consequences. Thus, in some instances, the womb seems to execute a see-saw movement, by which its long vertical axis is brought into a nearly horizontal line in the excavation, in such a way that the fundus remains either a little more elevated, or else somewhat more depressed than the neck. This displacement is called *retroversion*, when the fundus uteri is carried backwards into the hollow of the sacrum, and *anteversion*, when it is directed towards the symphysis pubis. These two varieties may occur in different degrees; but the displacement will be much more considerable in retroversion than in anteversion, on account of the anterior concavity of the sacrum; the former is also more frequent and serious than the latter.

Finally, in the latter part of gestation, the uterus may incline more or less to the right or the left, so as to constitute what have been termed lateral obliquities.

[If we may credit M. Salmon (of Chartres), who has published an excellent thesis for the "Concours" on the subject, retroversion of the uterus during pregnancy is not a very uncommon occurrence. Having already met three cases in our own practice, we are the more ready to accept his opinion as probably correct. It usually happens between the third and fourth months, and is rare before the third and after the fifth months. The observed cases occurred much more frequently in those who had already borne children, than in those who were pregnant for the first time.

As the displacement may be gradual or sudden, we may describe it according to its character in these respects.

The causes of gradual retroversion are: the normal inclination of the fundus of the womb toward the hollow of the sacrum in early pregnancy; the more rapid development of its posterior surface at the same period; a spacious pelvis, as insisted on by M. Chailly; the constant pressure upon the fundus by the abdominal viscera; and above all, a collection of fæces in the sigmoid flexure, of the colon, and retention of urine. Numerous discussions have taken place in regard to the effect of retention of urine in the production of this displacement, some thinking that the retention is an effect and not the cause, whilst others believe that distention of the bladder, so far from producing, would actually prevent the occurrence of retroversion. We agree with those who regard retention of urine as the principal cause of the gradual displacement, basing our opinion upon the fact that, by frequent emptying of the bladder by the catheter, the displacement will be spontaneously removed. As other causes of this occurrence during pregnancy, we have noted a previous retroversion, the growth of abdominal tumors and adhesions resulting from an old peritonitis, &c.]

When the retroversion occurs suddenly, it is produced by the same mechanism, only a more vigorous and energetic impulsion is then requisite; and such an impulsion is usually given by a rapid, violent contraction of the muscles: thus, after a severe retching, or vomiting, or after the strainings at stool, in women who are habitually constipated, or in urinating, in cases of retention, the womb is often found displaced.

M. Moreau relates an instance of a woman who lifted a weight of fifty pounds, for the purpose of placing it on the balance, when she was immediately attacked by pains in the hypogastrium, vomiting, syncope, &c. On his arrival, he found the uterus completely turned backwards; but all these symptoms disappeared immediately after the reduction was effected. A fall backwards, or blows, or a strong pressure below the navel, have very frequently caused the same result. (Nægèle.) In one of Hunter's cases, the retroversion appeared soon after a severe fright.

"A woman," says M. Martin, of Lyons, "was taken in her third month, after a violent straining effort, with pains, accompanied by loss of blood; at first, the os tincæ was found in the *centre* of the vagina; but the patient renewed her efforts, and then the uterus became completely retroverted, that is, the neck was placed behind the pubis and a little to the right, and the fundus of the organ rested against the sacrum. In this instance the retroversion evidently resulted from the conjoint influence of the uterine contractions and the expulsory efforts of the abdominal muscles." (Martin, *Mémoires*, p. 142.)

Where the displacement is effected slowly, the woman is but little incommoded at first; and the necessity for reduction is only apparent after it has become considerable. Originally, there are only some painful dragging sensations in the groins and lumbar region; a feeling of weight and pressure on the neck of the bladder; some vesical tenesmus, and a little difficulty in the emission of urine. But when the uterus attains a certain degree of development, all these phenomena increase, and we are then obliged to interpose the resources of our art; for when matters reach this state, the womb becomes wedged, as it were, in the middle of the pelvis, and even more firmly so afterwards, because its volume augments rapidly; for not only does the fœtus continue its growth, but also the uterine walls become engorged, tumefied, and inflamed, and the symptoms caused by this inflammation are added to those previously existing; and, further, as the space then occupied and filled up by the uterus is larger than the superior strait, the reduction becomes very difficult, or even impossible. Hunter relates a case in which the reduction could not be made, and the woman died in consequence; and at the autopsical examination it was found necessary to cut through the symphysis, in order to disengage the womb from the excavation.

When the displacement takes place suddenly, all these symptoms are speedily manifested, and should it happen at an early stage, they are shortly carried to the highest degree, or even may soon prove fatal, for their persistence may give rise to so great a distention of the bladder, as to produce its rupture.[1] Again, the accumulation of fecal matters in the intestine occasions so imperious a feeling of tenesmus, that the female gives way to the most immoderate strainings; and the pain caused by the displaced and inflamed uterus may create a convulsive agitation of the abdominal muscles and the vaginal walls, so great as to cause a rupture of the vagina, and an escape of the fundus of the uterus from the vulva; as happened in the case communicated to M. Dubois, by M. Mayor.

["Palpation of the abdomen," says M. Salmon, "is usually the first thing resorted to by physicians when called to a case of retroversion. The patients generally both know and say that they are pregnant, so that when the abdomen is examined in order to ascertain the cause of suffering, a large tumor reaching from the pubis to the umbilicus is almost always detected. This tumor is superficial, fluctuating, and dull upon percussion. It may bear no inconsiderable resemblance to the uterine globe, especially should it harden at intervals, as in one case which came under our notice. That the tumor is formed by a greatly distended bladder, is proved by the use of the catheter: it is important, however, not to be deceived by the statements of patients, who often believe that the bladder is empty because they are able to discharge a small quantity of water.

"Palpation of the abdomen is also useful in those rare cases unaccompanied by a distended bladder; for here the displacement of the uterus is indicated by the impossibility of detecting the fundus of the organ on a level with or below the superior strait of the pelvis." (Salmon.)]

The vaginal examination, in such cases, will enable us to detect the particular variety of displacement which causes the symptoms, for the finger encounters a tumor just within the vagina that fills the whole excavation, which is the posterior surface of the womb. In passing over this surface, which is of greater or less extent according to the stage of pregnancy, the finger reaches the fundus of the uterus, which it finds directed toward the anterior surface of the sacrum, and in more serious cases toward the point of the coccyx. Pursuing the examination anteriorly, the neck is discovered to be turned directly forward, toward the middle of the posterior surface of the pubis, and sometimes even raised above the upper edge of the symphysis. The displacement may indeed be so great that the axis of the organ is almost completely overturned and the finger cannot reach the external orifice. Sometimes, however, the neck is very accessible to the touch, although the retroversion is carried to the greatest extent. This is owing to the fact of the cervix being bent round on the body, like the beak of a retort. In this case, the uterus was retroflexed before being overset backward.

---

[1] The greatly distended bladder may then doubtless form a very considerable tumor, capable of increasing the retroversion mechanically, and of opposing the reduction. But the very intimate adhesions, by which the anterior and posterior surfaces of the uterus are connected with the posterior and inferior walls of the bladder, tend especially to augment the difficulties. The abnormal size of the latter organ keeps it very high in the pelvis, and the neck of the uterus evidently can only be brought downwards and backwards, after the relieved bladder has itself descended into the excavation.

In retroversion, a rounded tumor, varying in size with the volume of the displaced organ, is found in the vagina. This tumor spreads out more behind than in front, whereby the posterior vaginal wall is depressed, whilst the anterior is distended and elevated. Sometimes the perineum is prominent, and the vulva swollen, the rectum is pressed down and almost obliterated by the tumefied organ, and the anus often dilated and bulged outwards.

[Unpleasant to the patient as is examination by the rectum, it must be had recourse to when the indications derived from the above described measures lead one not merely to suspect, but to feel certain that the retroversion exists. It is the only method by which the uterine tumor can be explored over a considerable extent of surface, as there is nothing to prevent the finger from passing deeply behind it. Another advantage is, that whilst the vaginal touch enables us to appreciate better the position of the cervix at the bottom of the long cul-de-sac, behind the pubis, examination by the rectum affords precise knowledge of the character of the tumor formed by the fundus of the womb. (Salmon.)]

A particular variety of retroversion has been described by M. Martin, of Lyons, in which the os tincæ protrudes from the vulva, and the fundus uteri is pushed to the side of the sacrum; the uterine neck, being curved like the spout of a ewer, is situated below and a little in front of the pubis; the body of the organ is retained in the sacral excavation, and lies close to the perineum. But, after carefully reading his description, I do not think it can be justly considered as a new example of retroversion. I believe it was merely a falling of the womb, which had existed prior to pregnancy, and had been aggravated by this latter condition; there was at the same time an anteflexion of the neck, which explains how the curve in the latter, described by M. Martin, might be formed below and in front of the pubis, from the depressed body forcing it beyond the vulva.

A retroversion could scarcely be confounded with simple prolapsus; for, in the former, the vaginal wall is always situated between the finger and the tumor, and the neck is high up behind the pubis, whilst, in a prolapsus, the cervix is always the most dependent part, and the tumor can be perfectly isolated from the vagina; in the latter case, the reduction is generally easy, but it is usually quite difficult, sometimes even impossible, in the former. Further, the symptoms of retroversion are ordinarily much more severe than those of prolapsus.

[Without going into any detail on the subject, we would point out the possibility of mistaking a retroverted pregnant uterus for an intra-uterine fibrous tumor, abdominal tumors, or tumors of the cavity of the pelvis. The differential diagnosis between the unimpregnated uterus when retroverted and the same organ when similarly displaced during pregnancy may also prove somewhat difficult; still, the fact of the case may be generally arrived at by judging carefully of the size of the womb, and interrogating the patients in regard to the time of the last-menstrual flow. It would be easier to make a mistake in cases of extra-uterine pregnancy developed in the utero-rectal cul-de-sac, or of retro-uterine hematocele; in this case, however, the entire uterus is crowded out of position without being tilted, and it is often easy to feel its contour above the margin of the pubis.]

As a general rule, the prognosis in these displacements is very grave; it varies, however, with the period of pregnancy, the volume of the uterus, the alteration in the neighboring parts, and the violence of the attendant symptoms.

Cæteris paribus, a retroversion is usually more unfavorable than an anteversion; because, in retroversion, the constipation and retention of urine, which thus far have been considered as comparatively unimportant, soon become aggravating circumstances of the disease. In fact, the bladder can only enlarge and ascend into the abdominal cavity, by pushing the uterine neck upwards and towards the front; and hence, its body acting on the uterus by its size and weight, necessarily increases the displacement. The stercoraceous matters accumulated in the rectum, above the part in contact with the fundus uteri, act in a similar manner; and, again, all the woman's expulsory efforts have a constant tendency to further depress the fundus, after the displacement has once commenced. In anteversion, on the contrary, all the causes just enumerated operate in a favorable manner. Thus, the distended bladder constantly has a tendency to press back the body of the womb, which is then carried forwards, and the accumulated matters of the large intestine, pressing from above downwards on the posterior part of the neck, contribute to the same end.

[Sudden retroversion is more threatening in appearance than the gradual form. Both cases are serious in proportion as the pregnancy is in a more advanced stage, because the accidents which are liable to occur and the difficulty of reduction, increase with the size of the uterus. Independently of the accidental or gradual cause which produced it, and of the period of gestation at which it occurred, the danger, says M. Salmon, is in proportion to the importance acquired by one of the principal phenomena of the affection, viz., retention of urine. If the latter be complete, the symptoms become urgent in seven or eight hours, but if incomplete, the displacement may continue for fifteen, twenty, or twenty-five days without causing any serious results.

Retroversion generally terminates in recovery, though it may give rise to abortion. In some cases death may ensue from peritonitis, beside which rupture or gangrene of the bladder, or rupture of the uterus or its partial destruction by gangrene, may be apprehended.

Treatment.—In the first place the bladder must be emptied, as in its distended condition it would interfere with the attempts at reduction. It sometimes happens, indeed, that after the urine is withdrawn, reduction occurs spontaneously. Many practitioners have very justly insisted upon the advantage of catheterism repeated several times daily through the course of several days, as the only method of treatment; it has very often proved successful, insomuch that Burns felt authorized to say that retroversion would rarely last over a week, if the bladder were emptied three or four times a day. It is a course, therefore, which may be followed whenever the symptoms are not urgent.]

Treatment.—After having emptied the bladder and rectum, and combated the inflammatory symptoms by the appropriate means, the accoucheur should proceed at once to reduce the uterus to its natural position, and secure it there. The best position for the female to assume is one in which all the muscles are thrown into a state of relaxation; two fingers are then to be introduced into the vagina, with which the body is first to be pushed up, after which the index should be hooked over the neck so as to depress it.

The reduction may sometimes be effected on a single trial, but usually we are compelled to repeat the attempt after an interval of a few minutes; and just at the instant of the resumption of its ordinary position by the womb, a noise is heard, in some instances, like the click of a spring. It must not be supposed, however, that this operation is always an easy one. For the difficulty in using the catheter, so often experienced, the impossibility of emptying the rectum, and especially the voluminous tumor formed behind the uterus by the fæces collecting in the sigmoid flexure of the colon, the violent strainings made by the patient under such circumstances, and the size of the tumor, and its adhesions to surrounding parts, are so many embarrassing circumstances to the practitioner. Although it is very seldom that we cannot succeed in introducing the catheter, by time and patience, yet in some cases this has been found altogether impossible; indeed, much prudence is requisite in the measures then adopted, and if they all prove useless, a moderate pressure made over the hypogastrium may, perhaps, slowly compress the bladder, and thus make the woman urinate, so to speak, by disengorgement.

The retroverted fundus sometimes compresses the rectum to such a degree that an injection cannot be made to enter the large intestine.

Such cases demand some precaution in the administration of the enemata. There may be a collection of indurated matters above the fundus of the retroverted uterus, in which case it is evident, that, as the latter compresses the upper part of the rectum, an injection given in the usual manner cannot reach high enough to bring away the fæces accumulated in the descending colon. It then becomes necessary to use a long gum-elastic tube, which may be inserted to the extent of seven or eight inches. This simple expedient has often disencumbered the intestine of matters which an ordinary injection could not have reached, with the effect of producing spontaneous reduction.

Even with the use of the tube just recommended, the injections are sometimes ineffectual. In such cases, if the palpation and the abdominal percussion lead us to suspect a considerable accumulation of fecal matters in the descending colon, we should exhibit purgatives by the mouth. Again, the necessary introduction of the hand into the vagina, to effect the reduction, is at times so painful to the female, that, notwithstanding all persuasions to the contrary, she gives way to the most violent bearing-down efforts, which neutralize those of the operator. If baths, or emollient and narcotic injections, should not assuage this acute sensibility, the advice of Dewees might be taken, and bleeding practised to the extent of producing syncope; still better, in my opinion, would be the administration of chloroform before the operation.

The abnormal adhesions that are occasionally established between the uterus and adjacent parts, will certainly add another to the serious difficulties just mentioned; but even this should not give rise to despair. Amussat reports a case where he distinctly felt some bridles in the bottom of the vagina, and to the left of the tumor, into which he could hook the forefinger, but after a careful examination he acquired the conviction that the uterus was free on the right side. He then renewed his attempts, by acting in such a way as to turn the uterus from the opposite side towards that where the adhesions existed; that is, from right to left, and he thereby succeeded in replacing the organ in its natural position. But if, after having adopted all suitable precautions, the simple procedure just described should not succeed, one of the following plans should then be resorted to, namely, to act simultaneously by the vagina and rectum, as some have advised; but the most simple plan, however, is that of M. Evrat, quoted by M. Moreau, as follows: The woman must lie upon her side, and the accoucheur then takes a rod eight or ten inches long, covered at one end by a tampon of linen smeared over with some fatty matter, which he introduces into the rectum so as to press, through the recto-vaginal septum, the fundus uteri from below upwards, whilst the two fingers passed into the vagina hook the neck, and simultaneously draw it downwards and backwards. The force necessary for this reduction is very variable, though in effecting it we need not be restrained by the fear of producing an abortion; for, even if this were to result from such efforts, the dangers to the mother would be far less than from the continuance of the retroversion. In a case of this kind, M. Halpin, after having emptied the bladder, and endeavored unsuccessfully to reduce the uterus, came to the conclusion that the only mode of curing the patient was by the employment of an instrument that would bear equally on all parts of the displaced womb; and he imagined that the pelvis could be filled up with a bladder, and thus all the contained organs be pressed up together into the abdomen. With this view, he placed an empty one between the fundus uteri and the rectum, and then by cautiously distending it, he actually succeeded in pushing the fundus upwards.

Attributing, as they did, the difficulty of reduction to the pressure of the viscera upon the anterior surface of the uterus, Hunter, Boyer, and others, have recommended that the patient should be placed in such a position that the weight of the intestines may be supported by the upper part of the abdomen. Acting upon this suggestion, M. Godefroy adopts the following position: the patient rests her head and hands upon the floor, whilst the anterior part of the thighs and legs repose upon the edge of the bed, where they are supported by assistants. The surgeon then acts either through the vagina or the rectum upon the fundus of the uterus in such a way as to effect the reduction. In three very grave cases, success was complete. (*Journ. des Conn. Méd. Chir.*, August, 1846.)

This position is very fatiguing, painful, and disagreeable to the patient. I would, therefore, much prefer, in these difficult cases, simply to place the female on her knees in bed, with the upper part of the body supported on the elbows. I have thus been able, in two cases, to reduce retroflexions which had resisted every other means.

In an obstinate case, we might resort to a procedure recently employed by Amussat, with a prospect of success: that is, to place the female in the position for operating for stone, and then introduce one or two fingers into the rectum, and gently press up the uterine tumor, by following the concavity of the sacrum, at first directly upwards, and then alternating from right to left and left to right, so as to raise the whole surface of the uterus; but if the finger or fingers placed in the rectum cannot reach so high, the thumb should be put into the vagina so as to elevate the perineum, in order that the former may penetrate still further; and, lastly, to get higher yet, an assistant might press against the elbow, or the accoucheur himself could sustain it with his own thigh or body. M. Amussat declares that he has twice succeeded in this manner in making a reduction that had previously been ineffectually tried by several other practitioners.

Finally, what is to be done where the reduction is impossible? Abandon the patient to the resources of nature, says Merriman; but would not that devote her to a certain death, in case the inflammatory phenomena did not determine an abortion? And since a miscarriage is inevitable under the most fortunate circumstances, would it not be advisable to bring it on, rather than to leave the patient exposed for a long time to the dangers which threaten her? Indeed, most physicians are of this opinion, and I should not hesitate, therefore, to rupture the membranes by a sound passed through the neck of the womb. But, sometimes, the neck is so high up that it is wholly inaccessible; and then a puncture of the uterus itself must be resorted to. This latter operation has been performed both by the vagina and by the rectum, but I should think the first preferable. It is, without doubt, the last resource, but always ought to be chosen rather than the symphysiotomy recommended by Gardien and some other accoucheurs.

After the reduction (when that has been possible), the patient must remain in the horizontal position until towards the sixth month of pregnancy, and must carefully avoid all straining, whether in urinating or at stool. These simple precautions are all-sufficient, and generally render the introduction of a pessary useless; which latter, however, Baudelocque considers indispensable in most cases. Occasionally, the incontinence of urine, brought on by the pressure which the neck of the bladder has suffered from the neck or fundus uteri, may still continue some time after the reduction; and then, if the ordinary simple means do not cause its disappearance, we may resort to the warm mineral waters of Cauterets, Barèges, or Balaruc; to frictions with the tincture of cantharides, and blisters on the hypogastrium, together with tonics and astringents administered internally.

§ 3. ANTEVERSION.

Anteversion is very rare in the early stages of gestation, and, probably on this account, has been passed over by most authors who have studied the disorders of pregnancy. The manner in which the uterus is developed, the peculiar form of the anterior and posterior boundaries of the pelvis, and the normal direction of the organ, are so many circumstances which, just in proportion as they facilitate retroversion, render the occurrence of anteversion difficult. Besides, the influence which a distended rectum and bladder have in the production and increase of the posterior displacement, would tend to restore the womb to its natural position, should any circumstance effect a commencement of anteversion.

Notwithstanding these favorable conditions, anteversion has been observed by Chopart at two months, by Madame Boivin at three months, and finally by Ashwell. The case of the latter being, unknown in France, we shall give an analysis of it. I have myself twice detected it at two months in cases of women affected with incorrigible vomiting.

Mrs. M——, thirty-three years of age, and habitually very constipated, fell, during the first month of her pregnancy, whilst descending a pair of stairs. Though there was no hemorrhage, she had a spell of faintness which lasted nearly an hour. For five or six weeks there was a feeling of weight at the pubis, micturition was frequent and painful, but there was no obstruction to defecation. I examined her for the first time at the end of the second month. The cervix was in its normal position, but the strongly-inclined fundus formed a round solid tumor between the bladder and the anterior part of the vagina. Pressure with the finger upon the angle of inflexion caused pain. The neck was elongated, and larger and harder than usual. I endeavored, ineffectually, to effect reduction by pressing upon the fundus of the womb with the finger, whilst the neck was drawn downward and forward by the index of the right hand. At the sixth month, the husband found that the anteflexion had almost entirely disappeared, and although the lady still suffered some pain in the latter months, she was delivered without difficulty.

Although the author describes this as a case of anteflexion, it is evident that there was also anteversion, as is proved by the normal position of the neck, and especially by the spontaneous disappearance of the displacement at the fourth month. I see, indeed, no reason why an anteflexion should disappear suddenly at this stage of pregnancy.

Anteversion is, therefore, possible in the early months, though it occurs more frequently in the second half, and especially towards the end of the pregnancy. At that time, the fundus of the womb, which is naturally inclined forwards, is supported by the abdominal muscles only; now if these resist slightly, as often happens when women have had several children, the physiological inclination has a constant tendency to increase. The axis of the uterus may thus become nearly horizontal, or even be depressed still lower, until the fundus falls upon the thighs and knees. The neck, which is carried very far upwards and backwards, sometimes gets above the sacro-vertebral angle, and is reached by the finger with the greatest difficulty; the impossibility of attaining it has occasionally given rise to a belief of the existence of imperforation.

Beside the signs furnished by the touch and examination of the abdomen, some functional disorders may be produced by anteversion at different stages of pregnancy, whose cause should not be mistaken when called upon to treat them. In the early months, the sensation as of a heavy weight at the pubis, frequent and sometimes painful micturition and defecation, are almost the only rational signs. In the latter months, the weight of the uterine tumor, which is carried strongly forwards, occasions pains and draggings in the thighs and groins; the extreme distention of the skin of the abdomen, also, produces acute pain, and the pressure to which the bladder is subjected is the cause of vesical tenesmus, with dysuria or strangury. Finally, in the worst cases, walking is rendered difficult and often impossible.

The prognosis is not generally serious; for, when the anteversion occurs in the early months, the development of the uterus may restore it; when it occurs in the second half of gestation, it may produce premature labor, though it usually occasions merely the inconveniences just spoken of, and never gives rise to accidents in any degree serious, except during labor. (See *Dystocia.*)

Reduction may be attempted in the early months, but has hitherto always failed; too great perseverance would be at the risk of abortion. The most prudent course, therefore, provided resistance is encountered, is to intrust the reduction to the subsequent progress of the pregnancy. If the discomfort and weight are too fatiguing, they may be relieved by the horizontal decubitus.

At a more advanced stage, a body bandage, or a sort of corset or belt for the abdomen, well adapted to the size and form of the belly, will afford much relief. When the abdomen is pendent, the abdominal belt may be kept up by suspenders.

§ 4. LATERAL OBLIQUITIES.

In describing the physiological phenomena of pregnancy, we spoke of obliquities of the uterus, and pointed out their probable causes. They are rarely carried to any great extent, and are never the occasion of serious accidents. Only by tending to produce an unfavorable presentation of the child, and by retarding the dilatation of the neck, can they have any unpleasant effect upon the labor. Therefore, the present is not the proper time to speak of them further.

CHAPTER III.

DISEASES OF THE OVUM.

ARTICLE I.

DROPSIES.

§ 1. DROPSY OF THE AMNION.

The amniotic liquid may sometimes augment to a very considerable quantity; but, as the normal amount is very variable, it is difficult to say above what limits it should be considered as a disease; however, when it exceeds three or four pounds, the accumulation may be justly attributed to some morbid condition.

In the present state of our science, it would be absolutely impossible to designate the cause of this singular affection, although some facts seem to militate in favor of its being produced by an inflammation of the amnion; but this opinion requires further confirmation to be received without hesitation, for, notwithstanding Dr. Mercier claims to have seen the internal surface of the amnion covered several times by false membranes, and the membrane itself highly injected, yet other observers have not detected anything of the kind. (*Journ. Gén. de Méd.*, tom. xiv.)

Again, from the cases cited by Drs. Merriman and Lee, it would appear that a dropsy of the amnion is often associated with a morbid condition or a bad conformation of the fœtus, or with a state of general infiltration on the part of the mother; indeed, some facts would lead to the supposition that constitutional syphilis predisposes to this disease.

In a few instances, it has seemed referable to sanguineous plethora; but as it occurs in women of every variety of condition, constitution, and age, this cannot be considered as a fixed rule on this point. It is much more frequent in twin pregnancies, and rarely supervenes prior to the fifth month.

In some cases, the dropsy is preceded by all the signs of an active inflammation; but most commonly a dull pain in the uterus, a feeling of weight about the pelvis, and a rapid growth of the organ, are the only evidences of its existence. The womb speedily acquires a considerable volume, and is more distended at the fifth or sixth month than it usually is at term. Further, the development is proportionate to the quantity of liquid: thus, the latter often amounts to five or six pints; and Baudelocque reports a case in which thirteen pints escaped from the uterus, and another one of thirty-two pints. Certain authors have even known forty or fifty pints to exist in the amniotic cavity. The fluid is similar in all respects to the liquor amnii.

The uterus rarely becomes much enlarged without disturbing the functions of the thoracic organs in the manner heretofore described, and facts are not wanting to prove that it may even produce asphyxia.

In a case reported by Duclos, the distention of the womb was so great, although the gestation had only advanced to the seventh month, that it enlarged the abdomen beyond measure, pushed up the diaphragm, and interfered so much with the respiration and circulation that the woman's life seemed to be seriously compromised.

The physicians, called in consultation, decided in favor of bringing on the uterine contractions as soon as the neck showed any evidence of dilatation; but, suffocation being imminent, M. Duclos ruptured the membranes, at first permitting a certain quantity of fluid to escape, then, by keeping his fingers in the neck, he prevented its complete evacuation; and thus, for four times, after intervals of fifteen minutes each, he allowed a further flow, while slight pressure was made over the abdomen. In this manner, fourteen pounds were collected, without counting what was lost. The symptoms disappeared immediately, but as the uterus did not appear capable of any effort, and the neck offering no resistance, it was easily dilated, and a living infant brought away by the forceps. The child was feeble and diminutive, and its limbs were very small. The mother recovered.

M. Evrat, Sen., of Lyons, has published several cases of almost complete asphyxia (lividity of features, cessation of pulse and respiration), in which the women were rapidly restored by the puncture of the membranes and discharge of a large amount of water.

A premature distention of the uterus by amniotic dropsy, to the size which it usually has at the end of gestation, is capable of producing dangerous symptoms. It is astonishing, as Scarpa remarks, that in cases of dropsy complicating pregnancy, the womb should occasion symptoms of suffocation which it never determines at the end of the ninth month, though its size be the same. It is explained by the sudden and rapid development in the first case; whilst in the latter the distention takes place almost imperceptibly, the walls of the abdomen yield gradually, thus allowing the uterus to project more in front, so as to diminish its elevation slightly, whilst it crowds much less upon the diaphragm.

As before said, ascites often coexists with the amniotic dropsy; but as the two diseases may occur separately, it becomes important to establish their differential diagnosis.

In ascites complicating pregnancy, the urine is small in quantity, whitish, and turbid, the thirst great and constant, and the lower extremities and genital parts mostly much infiltrated. It is difficult and sometimes even impossible to distinguish the shape and fundus of the uterus, on account of the irregular form of the belly, and the enormous distention of the hypochondriac regions. Percussion produces an undulation, or sort of fluctuation, which is much more perceptible at the upper than at the lower part of the abdomen.

In dropsy of the amnion, the size of the belly approaches much more nearly that of a uterus at term, although the pregnancy may not have existed more than five or six months. The uterus is so rounded as to be almost spherical. Fluctuation is more obscure, thirst slight or absent, urine natural, and in some cases little or no infiltration of the lower extremities. The umbilical tumor is rarely present, and, when it exists, has not the transparency observed in ascites.

The great enlargement of the womb often provokes premature contractions and abortion. Sometimes the child is born living, but so little developed that it cannot survive; more frequently, it dies in the mother's womb, and is not expelled until some time after.

Dropsy of the amnios, which is so grave as regards the infant, rarely compromises the mother's life, or even her health. Some unfortunate cases have, however, proved fatal, though generally she is merely incommoded by the excessive volume of the womb, and the consequent interference with other organs. The expulsion of the liquid is generally spontaneous; the fœtus, membranes, and placenta passing away with the waters; whence, the cause no longer existing, the disease is completely cured.

According to some authors, the rupture of the membranes and consequent expulsion of the fluid is not always followed by the birth of the child. In this case, the breach in the membranes takes place at a point considerably above the neck, the uterus is relieved slowly of the superabundant fluid, and the pregnancy proceeds with no other accident than a more or less frequent discharge of water. I think that, in most of these cases, an accumulation of fluid between the membranes and the uterus, as in the hydrorrhœa to be spoken of hereafter, has been mistaken for amniotic dropsy. I confess, however, that the following case, carefully observed by Ingleby, leaves hardly a doubt as to the possibility of the fact: A lady, six months gone in her third pregnancy, lost suddenly a large quantity of water during the night. From this moment, until the termination of pregnancy, there escaped every two or three days a pint and a quarter of fluid. The woman was delivered of a large boy. The after-birth was expelled spontaneously. I received it in my hand, says the author, so as to avoid laceration of the membranes. I examined it with the greatest care, and discovered, besides the opening made by the head in the centre of the membranes, a second opening, of circular form, near the edge of the placenta. It was doubtless through the latter that the fluid escaped from time to time.

It is proved, by many observations, that amniotic dropsy frequently recurs in the subsequent pregnancies of the same female.

A remarkable circumstance, pointed out by MM. Bunsen and Kill, and one instance of which has come under my own notice, is a dropsical condition of the fœtus, it being sometimes affected with hydrocephalus, and at others with ascites.

The same authors also mention having observed that in these cases the placenta was often remarkably large. Thus, in a case reported by M. Kill, in which the extreme distention of the uterus produced abortion at the sixth month, the circumference of the placenta was a third larger, and its thickness double that of ordinary placentas. It was pale, and its tissue spongy, and, when divided, the vessels traversing its substance were found to have almost the size of the arteries and umbilical vein.

The abdomen of the fœtus contained a large amount of fluid. The liver was voluminous, occupying almost the whole abdominal cavity. Its structure was normal, without any indication of swelling, but its vessels were highly developed.

This great size of the liver is supposed by the authors quoted to be connected with the extreme development of the placenta, whose enlarged vessels would of course supply a great quantity of blood to the umbilical vein. (Churchill, page 50.)

When the malady is once established, it is exceeding difficult to find the proper remedies, — I will not say to cure, but even to impede its course; — for instance, diuretics have usually proved of little value. Some authors, indeed, seem to have observed good effects from dry diet; and Burns specially recommends cold bathing. But, in spite of all we can do, the affection ordinarily goes on increasing until the commencement of labor; and in the greater number of cases there is nothing to be done except to await this event. However, if the uterine tumor be of excessive size, more especially should the dropsy of the amnion be complicated with ascites and a general infiltration, and the patient's life be endangered by the obstructions to the hæmatosis, an evacuation of the waters should be determined upon by rupturing the membranes.

The puncture is usually effected by the use of a male or female catheter, or a stylet, which is introduced through the neck, and the membranes perforated with its extremity. When the cervix is sufficiently dilated, the rupture may be performed with the finger. When not obliged to act quickly, contractions may be previously solicited by introducing and leaving a piece of prepared sponge in the cavity of the cervix, or by practising some douches upon the inferior segment of the uterus. (See *Premature Artificial Delivery*.) But should the gravity of the symptoms demand immediate intervention, there would, I think, be some advantage in following the advice of M. Guillemot, and to glide the catheter between the ovum and the uterus, so as to pierce the membrane far above the neck; this process would permit the discharge of the fluid to be controlled, and only the superabundance, so to speak, to be withdrawn. The pregnancy may afterward be left to itself.

In case of complete obliteration of the neck, paracentesis by the vagina and in the vicinity of the uterine orifice must be performed. Scarpa and Camper recommend puncturing between the umbilicus and pubis. In one of the observations of Evrat, Sen., the operation was practised in the place, so called, of election, for paracentesis. The patient was delivered eight days afterward of two living children, and recovered perfectly. The details given by the author do not inform us whether the case was one of ascites, or really of amniotic dropsy, as he thought.

The vaginal puncture seems to me likely to subject both mother and child to the fewest risks, whenever the neck is inaccessible.

§ 2. HYDRORRHŒA.

The Germans have given this name to those discharges of water that occur n the course of the gestation, but which, in general, are neither preceded or followed by any uterine contractions; their nature is such as to interfere ut slightly with the pregnancy, the latter advancing as usual to term, and the accouchement the bag of waters is regularly formed.

This affection is quite common in the latter months, but very rare at the ginning of gestation. I observed it once between the third and fourth onth, and it reappeared but once during the remainder of the pregnancy, ich terminated happily. (See *Abortion*, article DIAGNOSIS.)

The frequency of such discharges, and the quantity of water lost each ne, are exceedingly variable in different cases. Sometimes the liquid mes away in gushes, at others drop by drop; but the amount may increase an incredible manner, and the loss may occur but once, or be renewed equently. Further, the intervals of its appearance are very irregular, and sting a long time when it does come on, during which any mental emotions r bodily excitement singularly influence the profuseness of the discharge. On the other hand, it augments in quantity during the most perfect quietude, s, for instance, at night during sleep; its cause can rarely be ascertained.

Most generally, the female enjoys her usual health before the discharge comes on, when she unexpectedly finds herself wet, the fluid escaping drop after drop, or else she hears the peculiar sound caused by the sudden irruption of a considerable quantity of the waters. In most cases, she suffers no pain either pending or after this discharge; though it may happen that a too rapid depletion of the uterus, and the consequent parietal retraction, may bring on some slight uterine contractions; but if the patient then keeps perfectly still, they soon disappear, and everything resumes its natural order. In color, the discharged water is usually a little yellowish, very limpid, and at times tinged with blood, leaving stains upon the linen, and having a well-marked spermatic odor.

Should the hydrorrhœa be attended with the uterine pains, it would be an evidence of an approaching abortion; and some accoucheurs, supposing the membranes had been ruptured, have been known, under such circumstances, to use every effort to accelerate and to terminate a labor which really had not commenced, and which, without their interference, would not have occurred before the ordinary period.

[We saw a case of hydrorrhœa during the sixth month of gestation, in which uterine contractions had come on and almost completely effaced the neck of the womb which was opened to the size of about a franc-piece. Rest in bed and opiate injections quieted the threatenings of abortion, and the patient was delivered at term.]

This error may be avoided by attending to the fact, that, notwithstanding so considerable a flow of liquid, the size of the uterus, its consistency and elasticity, are such as it generally presents at that period. These remarks will at least be sufficient to excite a doubt as to the true source of the waters; and from the moment that there is a doubt, every effort should be made to prevent and not to hasten abortion.

These fluids, although having no relation in their seat to the liquor amnii, have, however, been called the *false waters*, so as to distinguish them from those which escape after the membranes are ruptured in labor.

Various opinions have been advanced as to the nature and seat of these false waters; thus, certain accoucheurs have supposed that they were contained between the chorion and the amnion, and that their escape is due to a laceration of the chorion; others, that they are owing to the rupture of an hydatid, lodged either in the cavity or the neck of the uterus (Bœhmer, Rœderer). Again, Baudelocque was of the opinion that it resulted from the transudation of the liquor amnii through the membranes. Some others explain it by invoking an œdematous condition and an infiltration of the uterine cellular tissue. It is an easy matter to refute all these opinions by recalling the fact of the frequency and abundance of the discharges, which often come away in large quantities. Mauriceau, Camper, and Capuron supposed that these waters proceed from the interior of the amnion; for, in certain cases, they say, the membranes may yield at a point quite distant from the neck, and the superabundance of this fluid will then gradually drain away, though still an abortion may not occur.

This explanation is not applicable to the greater number of cases of hydrorrhœa, for observation does not show that when water came away several times during pregnancy the amount lost during labor was less than usual: beside which, careful examinations of the membranes after delivery have very rarely detected traces of old rupture. Some well observed cases, however, prove that Mauriceau's opinion may be exceptionally true. (See page 543.)

It is much more probable that the fluid which thus escapes in the course of gestation, sometimes a few days only before term, had accumulated between the internal uterine surface and some portion of the membranes (variable in extent) that were detached. This is the view advocated by Nægèle, and it has been lately reproduced by one of his pupils in a thesis sustained at Heidelberg, from which I have derived most of these details. That is to say, the fluid secreted by the internal surface of the organ gradually detaches the membranes, thereby forming a pouch for itself until its constantly-increasing quantity succeeds in separating them as far as the neck, when an irruption of the liquid takes place.

This theory was confirmed by the autopsy of a pregnant woman affected with hydrorrhœa. Dr. Duclos, of Toulouse, who relates the case, found the membranes partly detached and from that point the fluid escaped. Elsewhere the membranes were raised by an accumulation of fluid between them and the uterine wall, being thus ready, so to speak, to give rise to a fresh attack of hydrorrhœa whenever the detachment should extend to the cervix.

Now, if we admit with Professor Burdach, that an exhalation takes place from the internal surface of the uterus, which, by transuding through the membranes, reaches the amniotic cavity, and thereby contributes to the nutrition of the fœtus during the greater part of the intra-uterine life, it would be easy to explain this abnormal accumulation of fluids, either by an excess of secretion or an arrest of transudation. It may also be explained by supposing that the secretion continues beyond the ordinary term, and the liquid is obliged to create a cavity or a kind of reservoir for itself by detaching the membranes to a certain extent.

Generally speaking, this is not a serious affection; nevertheless, if frequently repeated, it might bring on premature contractions.

The treatment is very simple. The patient must maintain the most perfect rest, avoiding all moral and physical excitement during the flow, and for seven or eight days after it has ceased. Should it be followed by slight contractions, enemata, containing laudanum, would arrest them; and if the discharge is accompanied by any evidences of general or local plethora, these symptoms must be promptly met by the appropriate measures.

[§ 3. DROPSY OF THE VILLI OF THE CHORION. HYDATIFORM MOLE.

The villi of the chorion sometimes become distended by fluid which collects within them, causing them to swell and assume the form of rounded vesicles, comparable to gooseberries or grapes, and having, consequently, some resemblance to hydatid vesicles. On account of this analogy, they were, for a long time, supposed to be true hydatids. M. Velpeau was the first to discover that the hydatiform mole has its origin in the chorion, and the microscopic examinations of Prof. Robin exhibited still more clearly the true nature of the disease by showing that the envelope of the hydatiform vesicles have all the anatomical characteristics of the walls of the villi of the chorion. It is now regarded as certain that the disease known as hydatiform mole is nothing but a dropsical condition of the villi of the chorion.

Though the affection is a rare one, we have a good account of it in Dr. Cayla's thesis, which we have found very useful in the preparation of this article.

If an ovum, presenting the alteration in question, be examined, the villi are seen, as usual, detached from the surface of the chorion. In some cases, the pedicles will have undergone no change in size, whilst at others they will be slightly dilated. The dilatations, or vesicles, begin to appear where the ramification commences, the branches of the villi being found swollen at intervals. The dilatations vary in size from that of a walnut to that of a filbert, and so down until they become almost invisible to the naked eye. A whole villus is often almost completely metamorphosed into a bunch of vesicles almost as large as gooseberries. Upon the larger of these, smaller ones are often inserted, and generally by a very fine pedicle, a portion of the undilated branch of the chorion. The pedicle varies from ·039 to ·078 inches in length. Sometimes it is extremely fine, but may reach a diameter of ·039 inches; in which case it allows the fluid to flow through it from one vesicle into the other. More frequently, it is obliterated through a greater or less extent of its course. All the vesicles of the same group are, therefore, connected by pedicles, forming groups of the strangest appearance, but, nevertheless, recalling that of the villi in the normal condition.

It is generally easy enough to separate the vesicles from each other, and to trace the pedicles down to the chorion; sometimes, however, they are inextricable.

The fluid contained in the vesicles is usually colorless, transparent, liquid as water, and containing albumen in solution. Occasionally, the contents are of a reddish color.

This dropsical condition may affect either the villi of the chorion, properly so called, or those of the placenta, and in both cases the life of the fœtus is nearly always compromised. The dominant fact in the affection is, after all, the arrangement of the umbilical vessels. Should all the villi become dropsical, the death of the fœtus would necessarily ensue, and, occurring at a period very near that of conception, it might undergo solution in the amniotic fluid, and thus disappear.

Should the alteration of the villi be more recent or less complete, we should have an embryonic mole, in which the body of the fœtus would present various grades of development. Sometimes even, though rarely, when the alteration affects a small number of villi, the fœtus may be fully developed. Finally, a case of M. Brachet's proves that a few hydatiform vesicles occurring on the placenta do not prevent the birth, at term, of a healthy child of the usual size. It is certain that in twin pregnancies an alteration of one ovum may affect the other injuriously; still, some cases, reported in the Dictionary, in thirty volumes, show that one ovum may be transformed into a hydatiform mole, whilst the other fœtus undergoes regular development, and is born at term.

By what symptoms may dropsy of the villi of the chorion be suspected or discovered? If the alteration be slight, none of the usual signs of pregnancy will be wanting, and then a diagnosis will be almost impossible. If, on the contrary, the change is so great as to completely alter the ovum, the affection may be suspected and occasionally discovered. All writers admit that attacks of hemorrhage are common in such cases, and they almost always coincide with an unusual development of the uterus, whose size is no longer in conformity with the presumed period of gestation. These two symptoms are found conjoined in a case of M. Depaul's, already published by M. Cayla. The most important sign, however, is a too rapid increase in the size of the uterus, and by it was a positive diagnosis made in the following case, which we owe to the kindness of M. Pajot, from whom we received it. The account will be read with interest: "I saw a case of so-called uterine hydatids in connection with Dr. Gocherand (of Ivry), and although it was the third one of the kind which has fallen under my notice, the circumstances attending it were very different from my own two first cases, and afforded the opportunity of studying a much greater alteration of the villi of the chorion."

The patient was a young woman who had given birth to a child about a year previously, and who now supposed herself to be about three months pregnant. On making an examination I was astonished to find the uterus as large as at the eighth month of gestation. A very marked sense of fluctuation made me at first suppose that there might be a collection of fluid or a rapidly developed cyst of the ovary. However, I soon became satisfied that there was an accumulation of fluid in the cavity of the uterus itself.

By vaginal examination I found that the lower segment of the uterus was considerably developed. The neck was as soft as at the eighth month of gestation, and presented the indications of a previous labor. The finger could be inserted as far as to the internal orifice, which was closed hermetically. By passing the finger around the cul-de-sac, the left hand at the same time being applied upon the fundus of the uterus, the sense of fluctuation already perceived so clearly by palpation, as again evident. There was no solidity at any point of the abdomen. The atient's general health was bad; she had a dry, hot skin, and pulse at 120.

It was the only one of the three cases in which a diagnosis could be established. I advised the insertion of a gum-elastic catheter through the internal orifice, and e administration of ergot. The advice was followed the next day, and the patient pelled, together with a large quantity of fluid, a multitude of hydatiform vesicles, her in a detached state or in clusters of five or six together. The entire collec- n would have filled a man's hat. The vesicles were taken to Paul Dubois, who wed them to his class, and made them the subject of a lecture.

The evacuation was followed by no improvement in the general symptoms; the ient continued to lose strength, and died a few days after the operation. Unfor- ately, an autopsy could not be obtained. (Pajot.)

Although the uterus, in these cases, is generally too large for the stage of the gnancy, it is sometimes in the opposite condition. (Thesis of Dr. Louvet- arre.)

The pregnancy usually terminates earlier than in normal cases, expulsion of the m generally taking place before the sixth month, and in the usual manner; all symptoms which precede, attend, or follow it resembling precisely those of rtion, though the accompanying hemorrhage is commonly profuse.

The formation of an hydatiform mole rarely appears to have any effect upon the eral health of the patient, or upon subsequent pregnancies. Madame Boivin, ever, mentions some cases of women who were so unfortunate as to suffer eatedly from the affection.

ARTICLE II.

LESIONS OF THE VILLI OF THE PLACENTA.

Although changes in the structure of the placenta are quite common, our knowl- ge of them is as yet so limited, that in a work like the present we shall be able notice only the most important of them.

A clear statement of what may be said of the pathology of the placenta, makes it essary to revert to some details respecting the chorion and its villi. The two ter are composed of the same substance, that is to say, of a membrane formed of lyhedral cells, which are easily distinguished up to the sixth week. At a later riod their nucleolus disappears, the nucleus loses its transparency, and the cell elf becomes filled with granules. In this way the chorion soon assumes the pearance of a continuous membrane, which is more or less granular and sprinkled th nuclei.

In its beginning the chorion has the form of a regular hollow sphere, with smooth tlines; soon, however, its surface becomes covered with multitudinous prolonga- ns, to which the term villi has been applied. Almost all these prolongations traversed by a canal, which terminates in a cul-de-sac at the free extremity of villus, but opens freely at the internal surface of the chorion. This internal face is, therefore, covered with minute perforations, each communicating with canal of its respective villus. When the allantoid is formed, it becomes applied inst the internal surface of the chorion, and quickly sends vascular prolongations most of the villi. Some of these villi then continue to grow, so as to form the centa; the rest become atrophied in a way which has been well described by bin (*Archives Générales de Médecine*, 1848, *et Gazette Médicale*, 1854), and which rds the key to some of the lesions of the placenta. Prof. Robin's investigations y be recapitulated as follows: —

During the formation of the villi the development of some of them is arrested, that they contain no central canal, and consequently can have no participation in the allantoid circulation. They appear as solid cylinders, having imbedded in their tissue an abundance of grayish granules.

2. Although most of the villi are provided each with a canal, some of them fail to receive a prolongation of the allantoid; these, consequently, remain tubular, and are distinguished by the abundance of fatty molecular granules, with which their parietes are sprinkled.

3. Although nearly all the villi become vascular at a certain stage in the development of the ovum, most of them have become atrophied by the time the placenta is distinct. In following up this process of atrophy, the allantoid vessels traversing the villus are first observed to disappear, and the canal is quickly obliterated, being filled with a tissue resembling the reticulated magma. The walls of the villus itself become charged with fat in the shape of fatty granules and real oil-drops, sometimes scattered and sometimes in collections of various forms.

4. The placental villi occasionally present the same indications of atrophy as are constant in the other villi in the chorion; in other words, the placental villi may undergo atrophy, cease to be vascular, and exhibit an abundant fatty deposit in their walls.

We shall soon explain the mode by which the normal atrophy of the villi of the chorion gives rise to important lesions when it happens to extend to those villi which go to form the placenta.

FIBROUS OBLITERATION OF THE PLACENTAL VILLI WITH OR WITHOUT FATTY DEGENERATION.

The lesion in question has been described as *induration of the placenta, encephaloid, scirrhous, cancerous, tuberculous*, and *fatty degeneration:* still oftener has it been mistaken for a fibrinous deposit, the remains of a placental apoplexy. (See *Placental Apoplexy.*)

The degeneration appears in the form of grayish or whitish masses, which are always less red and moist than the rest of the placenta, and of a tissue which is hard, compact, friable, and but slightly stringy. This appearance has caused them to be mistaken for concrete pus, masses of crude tubercle or scirrhous formations. When, however, they are examined under the microscope, it is soon seen that all the parts of the tissue thus altered are composed of obliterated villi of the chorion with their tissue charged with fatty granules. All the ramifications, however, are not thus supplied with fat, since in the parts apparently the most diseased and distinguished by their whitish color, the villi contain no trace of fat granules, or have them only at long intervals. In a word, the lesion which we are describing is characterized by obliteration of the placental villi, precisely similar to the atrophy which invades the villi of the chorion after the formation of the placenta, and which we have described above.

This alteration is more especially met with at the circumference of the placenta, the cotyledons in that situation being the ones chiefly affected. It may always be found in the cotyledons of the periphery, or, at least, in a small portion of some of them: in this case, however, the affected ramifications of the chorion are lost, as it were, in the midst of those which remain pervious, and in this degree the disease is of no interest to the clinical observer.

In certain placentas, however, there will be one or several portions of cotyledons, or even one or several entire cotyledons, which have undergone fibro-fatty degeneration; and sometimes even the greater part of the placenta is thus transformed into a morbid tissue which is impervious to blood.

A placenta examined by MM. Laboulbène and Hiffelsheim had six of its cotyledons entirely obliterated, beside which there were discovered eleven other small yellowish masses, presenting the same external characters and structure as the diseased cotyledons. The altered cotyledons are sometimes scattered through the

ental mass, at other times they touch by their edges, but are always definitely
arated by deep furrows. The change is generally more evident upon the uterine
face of the cotyledons than upon the side of the chorion, for there the tissue
mes gradually its softness. humidity, and reddish hue.

If the placenta be emptied of blood," says M. Robin, from whom we borrow
ost the whole of this article, "the diseased cotyledons will project more than
healthy ones; but if the placenta be injected, the former will be depressed in
parison with the latter. This result is due to the fact that the ramifications
ch remained vascular in the emptied placenta, subside in consequence of the
harge of their blood; but as the obliterated ones do not collapse, their bulk
ains greater than that of the others. When, on the contrary, the healthy and
ular cotyledons are distended by injection, they form a larger mass than those
se subdivisions are obliterated, and appear in relief beside them."

he alterations just described are independent of hemorrhage or placental apo-
y. Whenever the two affections have been confounded, the observers were,
btless, deceived by their coincidence. It is, indeed, by no means rare to find
apoplectic space in the centre of the diseased cotyledons, large enough to contain
ea, a bean, or only a millet-seed, and the fibro-fatty degeneration of the villi
often been mistaken for a bleached clot. This confusion is now impossible,
aks to the microscope, which discovers in the mass of diseased cotyledons not a
ection of fibrin, but a network of atrophied villi of the chorion.

single argument remains in favor of the view which attributes them to apo-
y, to wit, that the hemorrhage which takes place causes the obliteration of the
ledons. To us it seems impossible thus to make the obliteration subordinate
he apoplexy, and M. Robin's researches tend to prove that the fibro-fatty altera-
may become a cause of hemorrhage as regards the neighboring villi which
tinue pervious. Moreover, as a matter of fact, placental apoplexy is met with,
hout obliteration of the cotyledons, and it is very often impossible to discover a
e of apoplexy in cotyledons which are completely obliterated. The two lesions
therefore, mostly independent of each other.

bliteration of the placental cotyledons is without importance as regards the
ther, but, as will be readily understood, may be highly injurious to the fœtus.
s, indeed, proved that an almost constant relation exists between the weight of
fœtus and that of the placenta. Now in the case before us, any obliteration of
villi cuts off by so much the active portion of the placenta; if but a few villi be
terated, the child experiences no bad effect from it, but if several cotyledons be
red, its development will be imperfect, and should half of the organ be invaded,
life will incur the greatest danger. In a still more advanced stage, its death is
ost certain.

ll our knowledge of the fibro-fatty degeneration of the placenta is, so to speak,
densed into the anatomo-pathological statement just given, and we are obliged
onfess, as does Dr. Millet, whose excellent work may be consulted with advan-
, that there is nothing to give us light upon the etiology of this lesion, no sign
h enables us to fix its symptomatology upon a certain foundation. Sometimes,
ever, there have been evidences of uterine congestion in cases in which the
ents had complained of weight or pain in the loins. These symptoms then
mble those observed in cases of placental apoplexy, and, we would observe, are
y so vague or even insignificant that it would seem to us almost impossible to
nose the fibro-fatty degeneration in a case of first pregnancy. As, however, the
tion is liable to recur and sometimes adheres tenaciously to the same woman
l her pregnancies, the accoucheur may take warning and let the least trouble
rring either to the mother or fœtus during gestation have its weight in his
mate of the situation. M. P. Dubois says, in reference to these matters, that,
sense of dull pain and fulness is connected with a slight diminution of the
ions of the fœtus, there is reason to fear that it is in serious danger.

It is possible, then, to suspect or even to foresee the fibro-fatty degeneration of the placenta; but how shall it be prevented? What course shall be pursued if the woman becomes pregnant again?

M. Dubois' advice to his pupils, under these circumstances, is thus briefly stated by Dr. Millet: Advise the patient to avoid all kinds of fatigue; insist upon her lying down, and prescribe a light diet for the purpose of moderating the circulation. At the same time practise a revulsive bleeding to the extent of from one to two ounces, followed the day after by a similar one. In connection with this apparently reducing treatment, M. Dubois, without fear of being taxed with inconsistency, adds the use of iron, inasmuch as it has appeared to him that women are predisposed to the affection by a certain degree of impoverishment of the blood. The iron would, at any rate, seem in several instances to have benefited the patients.

ARTICLE III.

EFFUSION OF BLOOD IN THE PLACENTA.

Utero-placental hemorrhage will be studied in all its connections when treating of abortion or the hemorrhages accompanying delivery (see *Abortion*, and *Dystocia*); we are, however, to speak in this place of certain effusions of blood in the substance of the placenta which present peculiarities deserving of special attention. These effusions differ considerably both in situation and form, the variety being due, for the most part, to the more or less advanced stage of the development of the placenta. Thus, if the blood occupy circumscribed cavities formed in the tissue of the organ, it takes the name of placental apoplexy given to it by M. Cruveilhier, and will be described in the next paragraph. Up to the third month, however, not only may the blood be effused into the placenta itself, but may even extend beyond its limits and spread over the entire external surface of the chorion. This last variety will be the first to engage our attention.

As utero-placental hemorrhage has been so well treated of by M. Jacquemier, we can do no better than borrow several passages of his description. Up to the third month, as stated, the blood effused into the placenta has a great tendency to spread itself over the surface of the chorion; in fact, it could hardly be otherwise, for at the outset the placental villi are not yet connected by the amorphous tissue which at a later period forms of them compact lobes, and the circumference of the placenta is not yet well defined, there being no distinct limit between the villi of the placenta and those of the chorion, which latter are destined soon to disappear. The entire surface of the chorion is, in fact, at this time covered with prolongations which separate to a certain extent its external surface from that of the decidua reflexa until both membranes are brought into contact through the atrophy of the villi. Should a rupture now occur of some of the utero-placental vessels either in process of development or but recently perfected, the blood therefrom would soon reach all the vascular tufts of the placenta and villi of the chorion by spreading itself in a layer between the ovular decidua and the chorion. The aborted ovum under these circumstances often has a fleshy appearance, its surface being more or less bluish or blackish, whilst its walls form an envelope of variable solidity and thickness. If it be entire, a careful examination will often detect on the external surface of the placenta minute ruptures opening into cavities and closed or not by coagulated blood. Frequently, also, there is no rupture, although the placenta may contain deep-seated, circumscribed cavities or extensive diffused infiltrations. If the layers of the decidua be stripped from the ovum, the entire surface of the chorion, the portion occupied by the placenta included, will be found covered by coagulated blood which is firmly held by the vascular ramifications of the placenta and the villi of the chorion imprisoned in its substance. Both chorion and amnion are intact, the amniotic fluid having a slightly red color by imbibition. If the embryo be very young, it may sometimes be found to be entirely dissolved, the only trace left of its existence being a very small bit of the cord still attached to the placenta by a few fragments of a very soft tissue. At other times the amniotic fluid may merely seem to be a little thicker than usual, resembling in this respect a mucilage of gum. Should the structure of the embryo be firmer, it will be found in its normal condition, only more or less withered and macerated according to whether the date of its death be more or less remote. The blood covering the entire surface of the chorion sometimes forms a firm and hard coagulum, which, occasionally, in some parts has lost its color and resembles the buffy coat of blood from venesection; at other times it is soft and presents the appearance of a black, thick, and granular fluid.

The amount of blood effused varies greatly, and the layer formed by it may be only from ·068 to ·136 inches. or from ·78 to ·1·17 inches in thickness. In the latter case, the ends of the villi will have lost their relation with the reflected and inter-utero-placental deciduas, thus producing an unnatural widening of the interstice which, in the normal state, is very small. The layer of blood is not of equal thickness at all points; in some places it collects in larger quantity, and that most generally where the placenta would have been formed. Ova thus affected have, sometimes, another appearance; thus, if during their expulsion the decidua has been removed, as often happens, they look like a clot of blood, but dissection and washing soon discover in their tissue the vascular ramifications of the placenta and villi of the chorion, showing that the seat of the effusion is the same as in the preceding case, and that they are not merely ova wrapped in their deciduas and enclosed in a clot of blood.

At a rather later period of gestation, say the third or fourth month, the effusion spreads much less over the surface of the chorion and shows a tendency to be confined to the placenta; still, it will sometimes extend beyond the edges of the latter in the form of streaks, projecting in various directions to a greater or less distance. The limitation of the effusion is due to the approximation and somewhat firm adherence between the chorion and the decidua reflexa, due to the atrophy of the villi of the chorion, so that a space no longer exists between the two membranes except for a variable distance near the border of the placenta. Even should we suppose that these effusions exert a considerable force, it is not generally sufficient to rupture the membranous envelopes which restrain them. Still it is not so very rare for the decidua reflexa to give way and allow the blood to pass into the cavity of the decidua and even reach the internal surface of the uterus. As an exceptional occurrence it is sometimes found to have ruptured the chorion and amnion, as in the cases observed by M. Gendrin, who found blood effused between the chorion and amnion, and even in the cavity of the latter, where it enveloped the embryo completely. Within the periods of fœtal life above mentioned, there can be no doubt that the effused blood proceeds from a rupture of the utero-placental vessels, even though it be impossible to detect any lesion upon the external surface of the placenta. It is impossible to suppose that the blood comes from the umbilical vessels, for we have seen that in some cases the embryo is so slightly developed as soon to be dissolved, whilst in others the amount of blood effused generally far exceeds the entire bulk of the embryo. If the umbilical vessels are ever ruptured, they could only be so consecutively to rupture of the utero-placental vessels, in which case the fœtal and maternal blood would mingle together.

An occurrence of this kind happening to the extent just imagined, would, generally, be fatal to the fœtus, though the ovum would not be expelled until later. As the effused blood is not in contact with the walls of the uterus, it does not stimulate the organ immediately to contraction, and it very often happens that when abortion takes place, the blood is found to have already begun to lose its color, as also to present other changes indicating that the hemorrhage must have taken place some time previously. Should the effusion be moderate, it would not seem impossible for gestation to continue. (Jacquemier.)

PLACENTAL APOPLEXY.

Mr. Jacquemier's book again guides us in describing placental apoplexy. From the middle of intra-uterine life the placenta continues to be quite frequently the seat of effusions of blood, which effusions are peculiar from the fact that they no longer extend beyond its edges between the now firmly united chorion and decidua. Instead of being diffused and occupying the greater part or even the whole of the placenta, these effusions are more fully circumscribed and confined to the lobes in which the ruptured vessels are situated, although they always show a strong tendency to extend toward the fœtal surface of the placenta. They also present varieties which may be described under three principal heads.

In the first variety there is no cavity, properly so called, produced, but the blood infiltrates the tissues of one or more lobes of the placenta, apparently diminishing its density. In some places it accumulates sufficiently to form little vacuoles filled with a very dark-colored fluid which in some cases has the appearance of a very thin jelly. (Jacquemier.)

In the second variety the effused blood forms a very irregular cavity, having prolongations in various directions, and the parts adjacent are infiltrated and stained of a reddish hue for a very considerable distance. The foci are usually quite large and mostly communicate with the external surface of the placenta through a rupture of greater or less size, with detachment of the parts corresponding; they are irregular in form and more liable to be found near the edge of the placenta in proximity to the coronary vein, which is sometimes ruptured, and communicating with the cavity. When the effusion takes place near the centre of the placenta it easily reaches the external surface of the chorion; and should it be near the point where the principal branches of the cord traverse the latter, a little blood will sometimes be found to have penetrated to a greater or less extent the tissues which surround the umbilical arteries and vein at the root of the cord. This condition has already been described in several cases, of which one published by M. Gendrin is very interesting; the cord, for the distance of two or three inches from the cavity in the placenta was infiltrated with blood, and yet there was no evidence of rupture of either of the umbilical arteries or of the vein. These irregular cavities in the substance of the placenta may be numerous, or there may be but one; and in case there are several, they may have been formed at the same period or at different times.

The third variety is the most remarkable of all; the cavities are here well defined and regular in form, even when the effusion seems to have occurred but very recently. Usually there are several of them, and judging from the appearance of the blood which they contain, they are produced successively. It is not uncommon to find seven or eight of them in the same placenta, and sometimes there are twenty or more. Simpson mentions a four months' placenta in which they were so numerous as to give the impression, upon dividing it, of a collection of innumerable, small, rounded, and distinct clots, closely compacted together. (*Dictionnaire en 30 volumes.*) It is rare for the clots to be larger than a pigeon's egg; some are as small as millet or hemp seeds, whilst others are of intermediate size. They are also situated at various depths in the substance of the placenta, some extending to the internal surface, and others approaching the uterine surface, upon which some of them open by a small and irregular orifice. The surrounding tissue of the organ is in its normal condition, and the appearance of extravasation of blood extends for but a few lines beyond the boundaries of the cavities. These regularly formed clots begin to lose their color at the circumference, so that at a certain period the cavity exhibits a white, thin pellicle, which detaches more easily from the clot than from the placental tissue. (Jacquemier.)

We have hitherto said that the placental tissue surrounding the cavities is in a healthy condition; but this is not always the case. It will be remembered, indeed, that it is not uncommon to find apoplectic collections in the centre of cotyledons affected with fibrous obliteration of the villi. (See page 551.) In such placentas occur very small, regularly formed cavities, enclosing clots of blood of an appearance compared by M. Jacquemier to black grape-seeds.

The blood effused in the tissue of the placenta, when the ovum is not expelled, separates into two portions, one solid, the other liquid. The serum disappears by infiltration, whilst the solid part forming a clot contracts, becomes denser and somewhat smaller, and gradually loses its color. The importance of the consecutive changes in the effused blood has, however, been greatly exaggerated; thus it was supposed that the transformation might be so complete as to produce whitish and homogeneous masses resembling concrete pus or tuberculous matter, but it is evident that in such cases effects have been attributed to placental apoplexy which were really caused by fibrous obliteration of the villi. (See page 550.)

We have said that when utero-placental hemorrhage occurs in the first half of pregnancy, it is occasioned by the rupture of some of the maternal vessels, generally the veins, and that it very rarely proceeds from the umbilical vessels. We think that the same observation applies to placental apoplexy.

The various kinds of apoplectic formations in the placenta may coincide with the lesion met with in uterine hemorrhages, whether internal or external; that is to say, with a partial or complete detachment of the placenta and the presence of a clot of greater or less size in the artificial cavity thus formed, together with streaks of coagulated blood stretching away to the cervix, and situated between the internal surface of the uterus and the uterine decidua. The ovum is then expelled prematurely, with the symptoms of an ordinary uterine hemorrhage. Effusions within the placenta, however, rarely occasion such extensive lesions, but are almost always limited and compatible with the continuance of gestation. The effect of placental apoplexy, moreover, varies with the period of gestation at which it occurs, as also with the number and extent of the effusions and the more or less frequent occurrence of the accidents. If the points of effusion are small and few in number, a considerable part of the placenta retains its natural structure and capacity for the fulfilment of its functions; in this case not only will the fœtus continue to live, but its nutrition will suffer little or not at all. Under opposite circumstances, if it should not die, it will be born feeble, puny, and emaciated. Should the apoplectic attacks recur at short intervals, they will often produce, in spite of all that can be done, gradual diminution of the motions of the child and of the pulsations of its heart, and the final cessation of both. In these unfortunate cases, it is not uncommon for both the mother and the accoucheur to be obliged to witness, as it were, the sufferings and death of the child. (*Dictionnaire en* 30 *volumes.*)

Apoplectic effusions in the placenta are rarely betrayed by any symptoms, provided the hemorrhage is limited in amount. In some cases, most of the indications of moderate internal hemorrhage are observed, though its occurrence will be rather a matter of suspicion than of certainty, unless the patient has suffered from the affection several times previously; for it is by no means rare for the same woman to miscarry several times consecutively, and always from the same cause; and if she should be delivered at term, a number of effusions, both old and recent, will be found in the placenta. (Jacquemier.)

Supposing there is reason to fear the occurrence of placental apoplexy, and especially if the woman is predisposed to the affection, the prophylactic treatment had recourse to in cases of uterine hemorrhage during pregnancy, will be indicated (see *Abortion*). As measures offering the greatest chance of success, we would mention absolute rest and small bleedings, to be repeated at longer or shorter intervals.

CHAPTER IV.

DISEASES AND DEATH OF THE FŒTUS.

§ I. Diseases of the Fœtus.

Although the diseases of the embryo and fœtus during intra-uterine life are numerous, they are very little known. As it does not enter into the plan of this work to treat fully of subjects coming under this head, the history of monsters and whatever else belongs to teratology will be laid aside, and we will merely present succinctly such diseases as are most interesting to the accoucheur in view of their endangering or destroying the life of the child. As we even think it best to defer the account of such as might obstruct natural delivery, until we come to treat of dystocia, our task for the present will be quite a limited one.

1. *Inflammation.*—Traces of inflammation have been detected in various organs of the fœtus. As the most important we would mention peritonitis, which was made the subject of a special treatise by our colleague and friend Dr. [illegible]. It was most frequently observed in lying-in hospitals during the prevalence of puerperal fever.

The pleura and lungs are sometimes attacked with inflammation, though less frequently. But although rare in the human species, it is very common in animals affected with epizoötic pneumonia,—a fact to which I called attention in my paper on puerperal fever.

2. *Fevers.*—It would seem that the eruptive fevers may be communicated by the mother to the child. There can be no doubt of the fact as regards variola, and we have nothing to add here to what has been said elsewhere (see pages 446 and [illegible]) on the subject; and the same remark applies to intermittent fever. (See page [illegible].)

3. *Icterus.*—Several observers have reported cases of women having icterus giving birth to children affected with the same disease, the waters also being of a yellow color. These are, however, exceptional cases, as it is far more common for children born of jaundiced mothers to be free from any abnormal color. (See page 451.)

4. *Syphilis.*—We have already said that syphilis may be inherited. The fœtus thus affected usually undergoes a very regular development; and not until some weeks or months have elapsed after its birth, do the accidents appear which, therefore, it does not fall within our province to describe. This, however, is not always the case, for it is by no means rare for the syphilitic fœtus to be born prematurely or even to die before birth. These children, like the former, when examined immediately after delivery, generally exhibit no lesion which can be attributed to syphilis, though in some, traces of the disease are evident, the most common being pemphigus of the palms of the hands and soles of the feet. When the bullæ are perfect, the eruption is easily recognized, but they are almost always ruptured and their place occupied by rounded erosions with elevated epidermis. Still they have a characteristic look. Pemphigus is more difficult to recognize when the eruption is beginning: it then appears in the form of small, red, and barely projecting spots, marked in the centre with a whitish point, due, doubtless, to a slight elevation of the epidermis. I have met with two cases of this kind, which are represented in wax models deposited in the hospital of the Clinique, and the reports of which were published by Dr. Bernardot (*Thèses de Strasbourg*).

Autopsies of the children sometimes reveal visceral lesions due to syphilis, such as certain alterations of the thymus gland, lungs, and liver. Prof. Dubois was the first to call attention to syphilitic alteration of the thymus gland. Externally the affected organ seems healthy, but if cut open and squeezed, a whitish fluid resembling pus exudes from it. When the lung is the seat of the lesions, these consist of indurated nodules varying in number and size, and of about the consistence of the liver, as stated in a detailed account of the affection by Prof. Depaul. Some of these indurated masses project beneath the pleura, under which circumstances they present quite a deep-yellow hue. At a later period they undergo softening and have at their centre a cavity containing a fluid of a sero-purulent appearance. The lesions of the liver have been well studied by M. Gubler, who describes them as being sometimes general, sometimes partial, and characterized by spaces of indurated yellowish hepatic tissue, whose normal structure is infiltrated with fibro-plastic elements and an albuminous fluid resembling the serum of the blood. The indurations are distinguished from the healthy tissue of the organ by their contour, hardness, and resistance to the finest injections.

5. *Dropsies.*—Hydrocephalus, hydrorachis, ascites, and cysts are affections to which the fœtus is quite liable; but as they often cause difficulty during labor, they will be treated of under the head of dystocia. (See *Dystocia.*)

6. *Spontaneous Fractures.*—Cases have been reported of spontaneous fractures, almost always multiple upon the same fœtus. Chaussier mentions a child born at the Maternity Hospital, in 1803, after a rapid and easy labor, during which no force had been applied to it, which had forty-three fractures, involving the cranium as well as other bones. Some of the fractures were recent, in some callus was forming, and others were thoroughly consolidated. Another case, cited by the same observer, is still more extraordinary. The child in question, which was born after an extremely short and easy labor, in a state of debility and of a bluish color, expired in a short time. Attention was attracted to it by its extreme shortness and an unusual mobility in the continuity of its bones. One hundred and thirteen fractures were counted by Chaussier, involving the different bones of the cranium, chest, and limbs (Jacquemier). The causes of this singular lesion are unknown; it is most probably due rather to arrested development of the bony tissue than to fracture properly so called.

7. *Complete or Incomplete Amputation of the Limbs.*—Cases not less curious than the preceding are those in which the children are born with limbs amputated at various heights, and having a cicatrix at the centre of the stump. Chaussier saw three deprived of the hand and a portion of the forearm. In one of these cases, a small bony cylinder found on the fœtal surface of the placenta was recognized as a portion of the radius. The stump, undergoing cicatrization, was covered at its centre with granulations. Watkinson, in 1824, attended a woman in her first labor who had experienced nothing unusual during her pregnancy. The child was born prematurely, and lived but twenty minutes. Its left leg appeared to have been amputated just above the malleoli. The foot, smaller than the other, was found in the vagina, but presented no appearance of gangrene or alteration of color or consistency. The two divided surfaces (of the foot and of the limb) were almost entirely cicatrized, and both presented small projections formed by the ends of the bones. Montgomery, in a work on this subject, relates two cases very similar to the preceding, in which the detached feet were expelled before the child. Cicatrization was complete in one, and far advanced in the other. (Jacquemier.) It would be easy, though I think useless, to mention other examples of this species of deformity.

Spontaneous amputation is sometimes incomplete; that is to say, grooves of greater or less depth, occasionally extending to the bones, are observed upon the limbs.

What is the cause of this singular lesion? Some have supposed it due to circular turns of the cord around the limbs, acting as does a ligature around the pedicle of a tumor; but it is very difficult to suppose that the cord could be drawn tight enough to amputate a limb without arresting the placental circulation at the same time. Montgomery's explanation is much more probable; he supposes the amputation to be effected by constricting materials other than the cord. In several cases were found fibrous bands, whose origin it is difficult to determine, which constricted the limbs as would real cords, and which would have occasioned complete or incomplete amputation according to the degree of constriction. It must, however, be said that these bands are not always to be found, so that the etiology of spontaneous amputation is very uncertain. It cannot be affirmed, says M. Jacquemier, that they are always the mechanical effect of a constricting agent; they may possibly be due to a deep-seated local lesion and to the constriction induced in the skin by an extensive cicatricial action.

§ 2. DEATH OF THE FŒTUS.

The causes which destroy the life of the embryo and fœtus are numerous, but we shall not attempt to recapitulate them here, referring the reader to the chapters which treat respectively of the diseases of the mother and of the ovum and fœtus, as also to the article on abortion. It must, however, be confessed that it is often impossible to determine the cause of death or to discover anything which can explain it in a satisfactory manner. Some of these unknown causes have attracted attention by the persistence with which they continue to act in the same woman through several successive pregnancies. I myself knew a woman in good health, who, on thirteen consecutive occasions, and without any discoverable reason, lost her child during the last month of gestation. Since Denman's time, it has been supposed that in these cases recourse might be had successfully to the induction of premature labor. We would also revert to the fact (see page 271) that in twin pregnancies one fœtus sometimes dies and assumes a mummy-like condition, whilst the other undergoes its regular development. This occurrence can only be known after delivery.

It is not always easy to assure ourselves that the fœtus is dead; it will sometimes be suspected when it ceases to move, especially after having been unusually active. At other times, the spontaneous motions gradually grow less frequent and weaker, and finally cease. Too much importance ought not, however, to be attributed to this sign, because the fœtal motions present numerous anomalies, even in the midst of the most perfect health. The surest indications are derived from auscultation of the fœtal heart. "In regarding the subject from this point of view," says M. Depaul, "we must set aside the three first months of gestation, during which the sounds of the heart cannot be heard, and also remember that in many cases it is impossible to perceive them before the expiration of the fourth month. During the last half of gestation, the conditions are altogether different, success in the stethoscopic examination being the rule, whilst failure should be regarded as a very rare exception. Inasmuch, however, as this exception may exist, it is impossible to attribute an absolute value to auscultation of the fœtal heart as a means of determining whether the child be living or dead. It would be a great mistake, however, not to regard it as an extremely valuable means, since, in the immense majority of cases, it leads to probabilities which amount almost to certainty, and consequently allows questions of the highest practical interest to be solved." (Depaul, *Traité d'Auscultation.*) Out of 67 women, more than five months pregnant, in whom M. Depaul was unable to hear the pulsations of the heart, but three were delivered of living children.]

Further, the phenomena experienced by the mother after the death of the fœtus are very singular in these cases: the abdomen collapses instead of increasing in size; the breasts, which had become developed, shrink; the woman suffers from a sensation of weight in the loins, and an unusual pressure in the lower part of the abdomen; an inert body in the uterus obeys the laws of gravity and falls to whichever side the woman turns in bed

Other symptoms are soon added to the foregoing. If the gestation is somewhat advanced, everything passes off absolutely as if the expulsion of the embryo had occurred, only excepting the discharge of the lochia: thus, in the course of forty-eight to sixty hours after its death, the breasts swell up, the phenomena of milk fever are manifested, and the lacteal secretion is fully established, after which the breasts again subside, and the usual order is resumed. As a general rule, the prolonged retention of a dead infant does not produce any disastrous result to the mother, and I suspect that writers have greatly exaggerated on this point: they say, indeed, that the woman becomes depressed, uneasy, and of a fretful temper; that she experiences lassitude, alternations of heat and cold, oppression at the epigastrium, headache, syncope, palpitations of the heart; her face is pale, the eyes dull and surrounded by a livid circle, the breath fetid, pulse frequent and irregular: in a word, all these general phenomena of a slow fever have been considered by them as so many rational signs of the child's death. But these symptoms are certainly absent in the majority of cases; for most women, after we have succeeded in calming their fears, experience nothing of the kind, and I have known many of them to carry a dead child for several months without even suspecting it, and some even to congratulate themselves upon the amelioration of their general condition, in consequence of the sudden disappearance of the sympathetic disorders of pregnancy. At an indeterminate period labor comes on, and the abortion is effected.

By examining the dead fœtus, we may learn why its prolonged sojourn in the uterine cavity has been wholly innoxious to the mother. In fact, the infant is not putrefied, as is proved by its having no bad odor; the solid parts undergo a peculiar transformation, and the body is somewhat analogous in appearance to one that has been soaked for a long time in water.

When the fœtus remains in the uterus thoroughly protected from the air, it does not putrefy, but undergoes maceration. M. Martin (of Lyons) judiciously remarks: "The kind of alteration which a dead child undergoes in the womb, will also vary according to the period of pregnancy at which it ceased to live. Thus, in the early stage of its formation, when its organization has but little consistence, and approaches the mucilaginous state, it dissolves in the waters of the amnios, which then become thicker and assume the characters of a gummy solution, and no further trace of the embryo is found in the amniotic cavity. But at a period somewhat later, that is, from the second to the fifth month, it withers away, becomes shrivelled and dried up, and looks like a little mummy of a yellow color, or like a fœtus preserved for a long time in alcohol. Not unfrequently, the placenta likewise participates in this state of desiccation, the liquor amnii disappearing and being replaced by a thick and apparently an earthy humor, which incrusts the fœtus." (*Mémoires de Méd. et de Chir. Prat.*, page 96.)

After the fifth month, a child putrefied in the womb presents so different an aspect from one that has undergone the same process in the open air, that it is only necessary to observe this particular condition once or twice, never to mistake it afterwards.

Imagine the little defunct stretched on a table: the flaccidity of its soft parts is then so very striking, that the head becomes flattened under the influence of its own weight, whatever position may be given to it; the soft parts on the thorax exhibit the form of the ribs; the front of the chest is very much flattened, the abdomen sunken and nearly hollow about the navel, and forming two large rounded projections on the flanks; even the extremities exhibit the same state of collapse. The discoloration of the skin is particularly remarkable, although often confined to the abdomen, at least when the sojourn of the fœtus in the womb has not been very long. The skin of this part has a brownish-red shade, without the least appearance of a greenish hue. This tint is less marked on the chest, neck, head, and limbs; nevertheless, it exists there also. But this is not the brownish hue that often succeeds a green putrefaction; it is a much clearer reddish-brown. The cord is no longer twisted, but it forms a true fleshy cylinder, of a reddish color, soft, and saturated with a brown fluid. The epidermis is detached from a considerable part of the surface, and may be easily separated from those places where it is still adherent, thus leaving the humid dermis exposed, which is as glutinous as if it were lubricated by a mucous fluid; and then the true skin has a bright rose color. The epidermis on the feet and hands is white and thick, and looks as if it had been corrugated by cataplasms. The subcutaneous cellular tissue is infiltrated with a reddish serosity, which is also seen between the muscles, and sometimes in the substance of the muscular tissue itself. The bones of the head are feebly held together, their periosteum may be readily detached, and they are movable on each other. The cellular tissue underneath the hairy scalp is infiltrated with a thick serosity, resembling currant-jelly in appearance. Finally, whenever we attempt to move or raise the fœtus, it slips through the hands just like a fish that lives for some time out of water, in consequence of the fluid mucus covering its surface. (Devergie, *Méd Legale.*)

A dead fœtus is merely a foreign body in the uterus, which will soon have to be discharged. The time at which the expulsion will take place varies greatly; sometimes after a few days only, sometimes weeks will elapse, and occasionally a month or more. The symptoms which arise will be those of abortion or labor, according to the age of the fœtus at the time of its death. (See *Abortion.*)

CHAPTER V.

OF ABORTION.

The term *abortion* has been applied to the expulsion of the fœtus from the womb, where this occurs at a period of pregnancy when the product of conception is not yet viable: that is to say, an abortion may take place at any time between the commencement of pregnancy and the end of the sixth month. The ancients applied the term *effluxio* to this accident, if it happened before the seventh day.[1]

---

[1] We place the period of viability at the *seventh* month, though well aware that some cases have been reported where fœtuses born at six, or five, or even four months, have lived; but such instances, besides not having all the authenticity desirable, are too rare to invalidate the general law.

In a recent and very remarkable article by M. Guillemot, this author admits three varieties of abortion, founded on the period of its occurrence: thus, *ovular* abortion is the title he gives when it takes place before the twentieth day; *embryonic*, if prior to the third month; and *fœtal*, from the latter date up to the sixth month of gestation.

Persons out of the profession, further, designate abortion under the title of miscarriage (*fausse couche*).

Abortions are much more frequent in the first two or three months than at any other period. The great vascularity of the uterine mucous membrane, become the decidua, and the ease with which effusions of blood may take place into the space which originally exists between the chorion and the reflected portion of the decidua (see page 552), sufficiently explain the frequency of hemorrhage, and consequently of abortion in the early months. In making this remark, I am not ignorant that Madame Lachapelle has given a different view, but it was because her position at the Maternity rarely furnished her with opportunities of observing abortions prior to the fourth or fifth month, for females do not usually go to the hospitals on account of the miscarriages of the first five or six weeks of gestation; and though other persons have since adopted her opinion, it is doubtless owing to the difficulty of diagnosis, and to the errors of females themselves, who, supposing they have only a simple retardation of the menses, allow an abortion to pass away in the early stages unperceived.

Morgagni and Desormeaux supposed that abortion of fœtuses belonging to the female sex are more numerous than of males, and I do not know whether the vulgar opinion opposed to this is true or false; but certain it is, that at term the boys exceed the girls in the proportion of sixteen to fifteen, which would seem to prove that female abortions are the most numerous; and besides, it is possible that the difficulty of distinguishing the sex in the earlier periods of intra-uterine life may have had some influence in creating the popular error.

The history of abortion evidently includes the study of the causes producing it, the symptoms and consequences which may arise, the signs by which it may be detected, and the more suitable indications for preventing or opposing it.

ARTICLE I.

CAUSES.

Considered in relation to its determining causes, abortion may be divided into the *spontaneous* and *accidental*.

The term *provoked* has also been used, where the abortion has resulted either from criminal efforts, or from the measures adopted by the scientific physician with a laudable object. We shall retain this division for etiological purposes.

§ 1. Causes of Spontaneous Abortion.

[The causes of spontaneous abortion may be sought for either: 1. In the father. 2. In the general health and habits of the mother. 3. In the state of the womb and its appendages. 4. In diseases of the ovum. 5. In diseases of the fœtus.

1. *Causes due to the father.* At first thought, says M. Ferdut, considering the transitory part taken by the father, it would not seem probable that he could be the cause of a miscarriage which should not take place until after two or three months. Such, however, is the fact, as is proven by the experience of women who invariably miscarried during the life of a first husband, but who were several times delivered safely at term after a second marriage.

The influence of the father in causing abortion may be exerted in two ways—by his constitution and by his diseases. Ova, fecundated by men who are either too old or too young, rarely become, it is said, fully developed, and the same remark applies to those whose constitution is exhausted by debauchery or excesses of any kind. From M. Devillier's article in the new *Dictionary*, it would seem, however, that he thinks the idea of an influence exerted by the father in the causation of abortion should be received with considerable reserve. We would remark, says this author, that the procreative power is entirely distinct from that of development. If a man, under the conditions mentioned, has been able to fecundate a robust and healthy woman, the generative influence once having been communicated by him, the development of the product of conception would thenceforth be almost wholly under the influence of the vitality of the woman; so that it is probable that the influence of the father would at least be very limited. (Devilliers.) It will also be understood that diseases of the father may, to a certain extent, be transmitted to the fœtus and produce abortion. Of all these morbid conditions, syphilis exerts a more deleterious influence upon the duration of pregnancy than any other, though, it should be stated, all authors do not agree upon the subject. We believe, at any rate, that we would be correct in saying that, in some cases, the father, and not the mother, ought to be subjected to a prophylactic treatment.]

2. *General Condition of the Mother.*—Women of a plethoric habit, and having copious menstrual discharges, are greatly exposed to abortion during the early months of gestation; in fact, we have already alluded to those hemorrhagic molimens that appear in them at every monthly period. Again, nervous, or very irritable women, those who are strongly affected by moral impressions, such as anger, chagrin, &c.; females of a sedentary habit, who are always shut up in the shops, as well as those that follow an indolent life, passing their time at balls or soirées, and in light reading, also abort very frequently. The surrounding atmospheric conditions are not wholly without influence in the production of abortion; in fact, we may refer to this cause those epidemic miscarriages spoken of by most authors. Mountainous countries, where the air is bleak, are considered as being favorable to their production; for, according to the report of Saucerotte, the women inhabiting the summit of the Vosges are very subject to abortion, and they are in the constant habit of descending into the adjacent plains to avoid this accident.

Acute diseases, especially the eruptive fevers, and small-pox most particularly, occurring in the course of pregnancy, abdominal or thoracic affections, and recent cutaneous diseases, often give rise to miscarriage. Syphilis in the mother has the most disastrous influence upon the progress of gestation, and even the mercurial treatment does not always secure from abortion. Some writers think that the administration of mercury endangers the life of the fœtus. Their opinion is, however, rejected by most modern writers upon syphilis, almost all of whom regard the antivenereal treatment begun at the outset of pregnancy, as the best means of preventing abortion. The numerous facts which have come under our own observation, have changed our opinion upon this point, and we now think it most prudent to begin the treatment as soon as possible.

It often happens, indeed, that, notwithstanding the existence of constitutional syphilis, when the mother has been treated properly and sufficiently long, the pregnancy continues to the full period, and the child escapes the infection to which it seemed fated. (Duval.)

According to the author just quoted, it would seem that much depends upon the length of time which the disease has lasted. "Numerous observations," he says, "show that syphilis at its commencement does not usually endanger the product of conception, but that, at a more advanced period, it involves the greatest peril." It should also be remembered that Dr. Paul's researches have shown that lead-poisoning may likewise produce abortion.

The convulsive diseases may occasion miscarriage either by provoking uterine contractions, or by directly destroying the child. (See *Eclampsia.*)

3. *Diseases of the Womb and its Appendages.*—The causes dependent on the uterus are referable either to a particular state of that organ, or to a peculiar habit of the body, the influence of which is reflected back on the womb. The following are given as causes of abortion dependent on this source: An excessive rigidity of the uterine fibres, and their consequent resistance to dilatation; an unusual contractility and sensibility of the organ, and too great a laxity and weakness in the uterine neck. I willingly admit that, in certain females, the excessive sensibility of the uterine fibre will scarcely support, without reaction, the strange modifications it must undergo during gestation; but I do not equally comprehend that species of opposition, which some authors seem desirous of establishing, between the resistance on the part of the uterine walls and the expansive force of the ovum. What, indeed, can an ovule, a few lines in diameter, effect against the thick walls of the womb? or, what action can it possibly have on the uterine neck, that will explain the influence which has been accorded to this pretended laxity of the cervix, on the frequency of abortions? The truth is, the ovum and the uterus are developed simultaneously, but by forces peculiar to each. Therefore, although abortions are more frequent in primiparæ, where the females have been married too young or too old; and although certain women abort in all their pregnancies at nearly the same period, we must not on that account attribute these accidents to too great a resistance of the body, or to an extreme laxity of the neck; for these repeated miscarriages, when not owing to the hemorrhagic tendency before alluded to, are far more naturally explained by the excessive irritability of the womb. The organ has to habituate itself, as it were, to its new functions; a proof of which is, that, in many females, the accident is repeated a number of times, but each time at a more advanced period; so that, about the fourth or fifth pregnancy, they go on till full term. Hence, those uterine congestions, which are so often produced in plethoric women by the menstrual periodicity, and that excess of sensibility as well as of irritability observed in nervous females, are the only two predisposing causes that I consider as belonging to the uterus proper, and even they are mere exagger-

ations, as will be seen, of the physiological condition. Where abortions are often produced by the influence of either of these, they are designated as *periodical.*

But, independently of these two causes, we must evidently take into account all the diseases of the uterus, whether acute or chronic, whose action is discernible: thus, the various tumors which may grow in the substance of its walls, or may contract adhesions with them and the foreign bodies developed in its cavity, also ulcerations, whether syphilitic or otherwise, which are so frequently found upon the cervix, are so many predisposing causes, which may both hinder and oppose its free enlargement; and lastly, let us add the various displacements of the uterus, such as prolapsus, lateral obliquities, or anteversion and retroversion, as acting in the same manner.

On the part of the appendages, all the chronic diseases to which they are subject; the adhesions, deformities, displacements, and their divers degenerations; the organic alterations of the tubes, fibrous, polypous, or other productions seated in the uterine tissue or neighboring parts; unnatural adhesions of the broad or the round ligaments, tubes, or ovaries: in a word, everything that can impede the easy and free development of the womb, must be regarded as occasional causes of abortion. (Madame Boivin, *Recherches sur une cause peu connue d'avortement.*)

Finally, an inflammation of the adjacent organs, particularly the bladder, rectum, &c., may, through the irritation thereby communicated to the uterus, bring on its contractions. Moreover, the existence of any voluminous tumor in the abdomen must necessarily incommode the development of this organ; also the compression of the hypogastrium, that some women produce by the use of corsets, may have the same effect.

According to Peu, we must add to these various sources of inconvenience, contraction of the pelvis opposing the distention of the womb, and sometimes its elevation above the superior strait; more especially when the narrowness of the latter coincides with the regular, or even an increased size of the excavation.

4. *Diseases of the Ovum.*—Any of the diseases of the ovum may give rise to abortion, and we shall not repeat what we have said concerning them. (See *Diseases of the Ovum*). It will suffice to mention here that the most important of these diseases are, dropsy of the amnion, hydrorrhœa, the hydatiform mole, placental apoplexy, and fibro-fatty degeneration of the placenta.

As regards the insertion of the placenta over the neck, I can scarcely believe that it could produce an abortion, and hence I imagine that the cases cited in support of that view have been misinterpreted; the insertion has been considered as the cause of the accident in those instances, when it certainly was nothing more than a simple coincidence. M. D'Outrepont has advanced the torsion of the umbilical cord as a cause of determining the death of the fœtus; for the state of compression, says he, resulting therefrom, may impede the circulation. The embryos had been dead for a long time, in all the cases of that kind observed by him.

Again, it may be asked, if the umbilical cord is too short, could it drag off or detach the placenta, or even be ruptured itself? Now, to the facts bearing on this point, reported by Mauriceau, Stein, &c., M. Guillemot adds the following: The fœtus was about three months old, the umbilical cord was tightly stretched and even half separated near its origin at the navel; two folds of it encircled the neck, and some deep marks were left on this part from their pressure. The circulation, he continues, was therefore interrupted in the cord by the tension and compression it sustained; and the strangling of the child's neck also contributed to its death. M. Deneux has furnished a case of a rupture of the umbilical vein, and effusion of its blood into the tissue of the cord itself; he found there a clot, equalling a small nut in volume, which had interrupted the circulation in the umbilical vessels by its pressure.

Lastly, the disease of the membranes, and of the umbilical vesicle, also prove a frequent cause of abortion, especially in the early stages of embryonic life; for in more than two hundred products of conception, that had not passed beyond the third month, M. Velpeau generally found an alteration of some part of the ovum.

5. *Diseases and Death of the Fœtus.* — Circumstances, which are often unknown to us, may arrest the development of the fœtus: for instance, it may be affected in the mother's body, by those acute diseases which at times beset it after birth; and such affections, though not always fatal to the new-born infant, are the most disastrous to the intra-uterine fœtus as they occur the nearer to the period of fecundation. (See *Diseases of the Fœtus.*) We may add, the presence of several children as a cause dependent on the child; in fact, we have elsewhere seen that the excessive distention produced by a twin pregnancy, frequently brings on premature contractions. However, the uterus is rarely developed enough prior to the sixth month to provoke such an accident, for this seldom happens until a more advanced stage, and then it no longer appertains to abortion properly so called.

Some diseases of the parents may affect the child; for example, a vitiated spermatic fluid communicates to the new being a principle which does not fail sooner or later to destroy it. M. Guillemot attributed the numerous miscarriages of a young lady who consulted him to this cause; for her husband, although of a suitable age, exhibited all the characters of premature decrepitude. Having become a widow, she remarried, was several times pregnant, and was always delivered happily at full term.

The mother, also, may transmit her diseases to the child. Nothing, indeed, is more common than to find children presenting, a few weeks after birth, evident traces of the venereal infection received from the mother during intra-uterine life, and hence we may conceive that this hereditary taint may prove fatal to the fœtus whilst still within the womb.

Small-pox is also sometimes communicated from the mother to the fœtus, and causes its death. It is remarkable that several circumstances seem to prove, that the infection frequently does not take place until after the mother's recovery. (See page 447.)

In some cases, the body of the mother is but the conductor of a contagious principle of small-pox. We might here add examples in addition to those already cited (page 447).

Some years ago, a woman, in the wards of Professor Fouquier, was delivered of a dead child affected with small-pox, although she had herself been vaccinated. Finally, the illustrious Mauriceau relates that his mother, when in the last stage of her pregnancy, had the misfortune to lose the eldest of her three sons by small-pox, to whom, notwithstanding her condition, she was unceasing in her attentions; and that at his birth, which occurred the day after the death of his eldest brother, he presented four or five pustules of small-pox.

In short, all the diseases to which the fœtus is subject may be followed by abortion. Its death always produces it.

§ 2. Causes of Accidental Abortion.

Besides the causes just enumerated, that have been designated by most writers as the *predisposing* ones, but which, perhaps, would be more appropriately called *slow-acting causes*, there are yet some others that might be termed *accidental* causes: such as those which operate from without, and make their influence more promptly felt. The latter are very numerous; indeed, on reading the published cases, we find that authors have considered all the moral and physical excitements that women are subject to, as so many causes of abortion. In most of the recorded instances, we can readily satisfy ourselves that the observers have attached too much importance to these occasional causes of its production; for, generally speaking, it would have occurred without them, only, perhaps, a little later; and even here the expulsion of the fœtus is, in truth, owing to the slow and gradual action of the predisposing cause. However, there are some accidental causes whose influence is indisputable. For instance, falls, excessive fatigue, too frequent coition, and severe contusions, have, in some instances, produced immediately a loss of blood, followed by abortion.

Falls and contusions may act in two ways: either by bruising or violently irritating the mother's organs, or by wounding the fœtus, and determining its death. The latter has been denied by some persons; but to the instances now known to science, I will add the following from my own observation: A young woman, six months pregnant, struck her abdomen violently against a table while walking in the dark in her chamber; during the night, the motions of the child were for a time quite tumultuous, then they diminished, and on the following morning could not be perceived at all. Two days afterwards she was delivered of a dead child, which presented an ecchymosis on its back as large as the palm of my hand.

Burdach speaks of a woman who received a blow upon the lower part of the abdomen, when in the sixth month of her pregnancy, and who was delivered of a child, the bones of one of whose legs and of a forearm had been fractured, and united at an acute angle. The jarring attendant upon travelling by rail, or too great use of a sewing-machine, are also capable of giving rise to abortion.

I shall not enumerate here the various circumstances that have been considered as occasional causes; but, by way of showing how their importance has been overrated, I will merely remark that, although certain women, who are constitutionally predisposed to miscarriages, may abort in consequence of a trifling fright, or the odor of a badly snuffed candle, yet there are others, on the contrary, who will suffer the most acute moral impressions, and the most violent physical shocks, without any accident whatever resulting therefrom; and nothing would be more easy than to bring forward numbers of cases in support of this proposition; the following, however, may be sufficient: I had an opportunity of observing, at the Hôtel Dieu, when acting as an "interne" in the obstetrical wards, a young girl in the fifth month of pregnancy, who, being rendered desperate by the desertion of her lover, cast herself into the Seine, from the Pont Neuf, yet, notwithstanding so violent a shock, the gestation pursued its regular course. Again, M. Gendrin speaks of a young lady who was thrown from a chaise over the horse's head by the animal falling in his career. This lady was then five months pregnant, but the accident did not prevent her from reaching her full term. I met with a case precisely similar in the wife of a notary living near Paris.

I was consulted, in Sept., 1845, by a young lady, who was evidently six or seven months advanced. Her physician had suspected an inflammatory engorgement of the womb, and during the third or the fourth month this gentleman had applied fifteen leeches on the neck of the uterus itself; and, strange to say, not only was this application unattended by any accident, but the patient seemed relieved of the distress and pain in the hypogastrium. And, lastly, is it necessary to refer here to all the manipulations, and all the violent remedies, that some distracted women make use of in vain to procure an abortion?

§ 3. Causes on Account of which Abortion is artificially produced.

The third order of cases still remaining for our examination are the means of producing abortion. These must be distinguished according to the proposed object: that is, whether, in producing an abortion, the indication be to relieve the woman as well as the infant, if the latter is well developed, from the dangers that threaten them (and we shall treat of the means to be employed in such cases when we speak of the indications presented by the mother's vices of conformation), or whether, contrary to all the laws of morality, the design is to destroy the fœtus in the body of its mother, for the sole purpose of concealing the traces of an illegitimate pregnancy. But we have nothing whatever to say concerning the measures resorted to by criminal hands in such cases, for, unfortunately, they are too well known.

ARTICLE II.

SYMPTOMS OF ABORTION.

The signs of abortion vary with the period of its occurrence, and also with its determining cause. Thus, when it happens in the early days of gestation, it is attended by but very few remarkable phenomena; and, in general, the pain is so trifling that the patient scarcely suffers more than from a difficult menstruation. The first uterine contractions are sufficient to produce the complete separation of the ovum, the adhesions of which are still very feeble; and it escapes either in mass or in shreds, usually surrounded by fluid or half-coagulated blood, and, being mistaken for a clot, it often passes away unnoticed, most women then supposing that they have only had a slight postponement of their menses, followed by a more difficult and abundant flow than usual.

At a more advanced stage, the symptoms are much better marked, but still vary with the cause of the abortion. For instance, when this accident has been produced under the influence of bad health in the mother, or of chronic diseases, or those causes that operate slowly, by altering the genital organs, or the ovum and its membranes, the following symptoms are ordinarily observed, namely: shiverings succeeded by heat, anorexia, nausea, thirst, spontaneous lassitude, palpitations, cold extremities, pallor, sadness, depression of spirits, tumefaction and lividity of the eyelids, want of brilliancy in the eyes, a sense of sinking at the epigastrium, of cold about the pubis, of weight near the anus and vulva, pain in the loins, vesical tenesmus, frequent ineffectual desires to urinate, and a weakness and flaccidity of the breasts, from which a serous fluid sometimes exudes. These phenomena may be considered as the precursors of an abortion; for, when they have lasted for some time, the pains in the loins become more and more acute, extend round to the hypogastrium, and are renewed at short intervals, finally assuming all the characteristics of the regular uterine contractions. During these pains, if the uterus is sufficiently high up to be easily distinguished above the pubis, it will be felt to harden sensibly, whilst at the same time a sanious discharge takes place from the vagina, afterwards becoming sanguinolent, and eventually replaced by liquid or grumous blood. If the woman be then examined per vaginam, the neck will be found partly dilated, the dilatation advancing progressively with the frequency of the pains; the membranes begin to protrude, then engage, and ultimately rupture; the waters escape, and the fœtus and placenta are successively expelled. Usually in those cases in which the cause has operated slowly, whether dependent on diseases of the mother or affections of the ovum, the fœtus dies before the labor, or at least during the first pains.

When the abortion is a consequence of the occasional violent causes, it usually has quite another course. Thus, in some instances, the expulsion of the ovum closely follows the accident; a woman slips in descending a staircase, and falls violently on her seat; when she rises, her clothes are flooded with blood, for an ovum of six weeks has been driven out, together with a large quantity of fluid blood. This, however, is more apt to occur in the beginning of pregnancy; for, at a more advanced period, some interval always elapses between the accident and the consequent abortion. The phenomena then observed vary, according to whether the cause has affected the mother's organs, or has directly influenced the fœtus itself.

In the former case, the mother experiences, at the time of the accident, a sharp pain, either about the loins, or else in some part of the abdomen; after the lapse of a few days, during which the pain has diminished, or even entirely ceased, it is violently renewed, and followed almost immediately by uterine pains and contractions, a slight dilatation of the neck, some discharges of serosity from the vagina, at first reddish, then sanguinolent, and lastly pure blood.

Finally, if the travail continue, the fœtus is expelled as usual, and often living.

The expulsion is almost always effected very slowly, and the progress of the labor is far from being as regular as at term. The resistance occasioned by the length and hardness of the cervix at this period sufficiently explain the extreme slowness of its dilatation; and even when the latter is sufficient, the contractile powers of the uterus are yet so feeble that the ovum may remain engaged in the orifice for several days, and even project into the upper part of the vagina, before being expelled completely.

When the cause has acted directly upon the fœtus, either mechanically, as by a violent blow or concussion, or physiologically, by destroying to a greater or less extent its vascular connections with the uterus, the subsequent course of affairs is different; for here the phenomena which announce the death of the product of conception are the first to be manifested. After the few hours necessary to dissipate the agitation and fears caused by the commotion she has experienced, the woman feels no pain nor inconvenience; everything is calm, and seems to resume its natural order; but, after the lapse of a few days, sometimes only eight or ten, the movements of the fœtus, which had up to this time maintained their usual force and frequency, become weaker, are separated by longer intervals, and finally become imperceptible. From this moment, the uncomfortable sensations and digestive disorders, which had annoyed the patient from the outset of pregnancy, disappear as though by magic; the swelling of the breasts and prickling sensations which had affected them, also diminish or cease entirely. A miscarriage is then inevitable, for the ovum is a foreign body in the uterine cavity, and soon irritates the walls of the organ by its presence; the latter contracts, and the expulsion is generally effected about eight to nine days after the accident. In this case, the process advances in a more regular manner, because the womb has had time to prepare itself for the act. However, this term is not uniform, it being not at all uncommon for the dead fœtus to remain much longer in the womb: two or three weeks, or a month, for example. I saw a woman at the Clinique, in whom the child's death was clearly ascertained, though she did not abort until six weeks afterwards. Cases are also recorded of the embryo remaining in the womb until the ninth month.

The development of the contractions is solicited by the derangement which this condition of death gradually produces in the placental circulation; indeed, the quantity of blood arriving in the placenta often diminishes by degrees, and ultimately becomes almost nul; but this is not always the case, since, in some instances, the circulation continues, and the placenta enlarges,—attains even to double the volume of that at term, and after its expulsion exhibits the same degree of integrity. Lastly, in other cases, says M. Guillemot, the placenta retains its vitality and grows; but, at the same time, assumes unusual forms, and a singular structure, exhibiting a cavity in which remains of the fœtus are hardly to be found.

Where a long time thus ensues between the period of the child's death and that of its expulsion, there is, in general, less danger from hemorrhage than if the premature labor had taken place immediately. In these abortions, less blood is usually lost than in the labors which come on naturally, after the most favorable gestations; which is probably owing to the fact that the child's death diminishes the activity of the uterine circulation, especially that of the utero-placental vessels, which must then become obliterated in a great measure, and consequently can furnish but little blood at the time when the placenta is separated.

We have seen (page 558) that the general phenomena experienced by the mother after the death of the fœtus are very singular in these cases, but abortion does not always follow immediately, a variable interval, sometimes a long one, intervening before labor begins. The child born under these circumstances has a peculiar macerated appearance, but no evidence of putrefaction.

But it happens otherwise when, the fœtus being dead, the membranes are ruptured, and the expulsion is delayed; for then a rapid putrefaction sets in, as a consequence of the contact of the child with the external air. A high fever, characterized by the symptoms of a veritable infection, develops itself; a dark fetid liquid oozes from the genital parts, mixed with shreds, in a state of putrefaction; and if the uterine contractions do not speedily relieve the organism from this source of infection, the patient may rapidly succumb under its deleterious influence. Finally, when the abortion is brought on by the existence of two children, the twins are nearly always expelled simultaneously; although we have occasionally known the women to abort of one child in a multiple pregnancy, whilst the other continued to grow.

Hemorrhage is one of the most common symptoms. It may precede, accompany, or follow the expulsion of the fœtus, and is of such frequent occurrence that most authors make it the principal disorder. In some cases it is certainly the cause of the abortion, though often merely a consequence. Sometimes, indeed, the miscarriage is accompanied with but slight hemorrhage. The latter circumstance is, however, rare, especially in the false labors that take place before the end of the fourth month; because a more or less abundant discharge of blood nearly always shows itself during the first expulsive pains, and persists until the uterus is completely emptied; but, as we all know, nothing of this kind is observed in labor at term. M. Jacquemier has happily explained the difference between the two in the following manner: He states that, towards the end of gestation, the placenta spreads out from the centre towards the circumference, in order to conform itself to the uterine enlargement at its greater extent; and this is accomplished in such a way that its different lobes, by separating from one another, have a considerable space left between them.[1] From this it follows, that, within certain limits, the uterine contractions have no tendency to detach it; for the placenta accommodates itself wonderfully to the retraction of the organ until it reaches its own proper limits; and even then its great flexibility permits a further reduction, so as to follow the uterus as it becomes less, before the detachment commences, and this latter phenomenon only takes place when the entire fœtus is nearly expelled. But, prior to the fourth month, the after-birth is far from offering the same conditions; since the thickness of the utero-placental decidua and the large amount of plastic matter interposed between the lobes at that time, confer upon it a much greater density; and therefore it can only yield within very narrow limits, either in the way of extension or retraction towards its centre. Hence, the facility of its separation during the early contractions, the rupture of a certain number of vessels, and the incessant hemorrhage throughout the whole duration of the labor.

---

[1] To convince one's self of the truth of this fact, it is only necessary to see the placenta still adherent to a uterus which has been developed but is not yet retracted, or even the uterine surface this mass occupied; for the latter is nearly one-third larger than the surface of the placenta which covered it. (*Jacquemier.*)

ARTICLE III.

DIAGNOSIS.

Judging from the numerous signs just given, the diagnosis of an abortion ought to be very easy; but, unfortunately, these signs are not very clearly marked until the accident is inevitable, and consequently, when it is a matter of indifference to the patient whether the physician makes out a clear diagnosis or not.

It is, therefore, in the beginning of such symptoms, especially, that we should endeavor to recognize their true nature, because then only can our art succeed in arresting their progress; but this is exceedingly difficult.

The diagnosis of abortion involves the solution of several questions. Is the woman pregnant? And, supposing the pregnancy to be determined, are the symptoms those of a simple uterine congestion, or of a commencing abortion? Lastly, is the abortion inevitable?

1. *Is the Woman Pregnant?*—This first question is quite readily resolved after the fourth month of gestation, though before that period it is almost always unanswerable. All practitioners of obstetrical experience are aware of the difficulties which often involve it. Thus, a woman in good health has her courses suddenly suppressed for several months without any appreciable cause, the breasts swell, and the body increases in size: in a word, she experiences several of the phenomena properly regarded as rational signs of pregnancy; then, all at once, at the return of the third or fourth menstrual period, some symptoms of congestion of the uterus appear, last for several days, and are soon followed by a slight flow of blood. How, then, shall we determine whether the pains felt by the patient, and the discharge of blood from the vulva, are owing to a return of the interrupted menses, or to an approaching abortion? The pains attendant on difficult menstruation, especially after a suspension of several months, resemble greatly, both in situation and intermittence, those of abortion. According to Madame Lachapelle, in abortion the uterine orifice is open, the hemorrhage precedes the pains, and the latter persist notwithstanding the abundance of the discharge; whilst in difficult menstruation the orifice is closed, the pains are felt before the hemorrhage appears, and they diminish or even cease entirely when the discharge is well established. The contrary, however, not unfrequently occurs.

Doubtless a strict investigation of the circumstances which accompanied and followed the suppression of the menses, and an examination of the uterus, might lead to an opinion as to the probable state of the case; but what experienced physician does not know how deceptive are all these rational signs, when we take into consideration the tendency to exaggerations of the females, who so readily believe what they wish or what they fear, as also how nearly the congestion, which precedes and accompanies the suspended menstruation, places the uterus in the same physical conditions as in a commencing pregnancy?

Does the blood escape from the genital parts as a clot? It has been hoped that the shape of the latter might furnish a reliable sign.

It has been stated that the clot driven from the unimpregnated womb exhibits a triangular form, corresponding to that of the cavity where the blood coagulated, which never happens when a product of conception is present; but this may fail, as the clot is mostly changed in its shape by traversing the neck; and, on the other hand, in abortion, the blood may collect and coagulate in the vagina, and the coagulum exhibit the indicated character.

But, if the coagulum be still in the cervix uteri, and supposing the finger is able to reach this point, how can we distinguish whether the foreign body felt there is a clot or ovum? For this purpose, Holl has laid down the following signs: If the finger introduced into the orifice perceives the mass to become tense during the contraction, to augment in volume and advance towards the vulva, it is an ovum engaged in the os uteri; and if it were a clot, it might be recognized by its fibrinous structure; besides, during the pain, its exterior surface would not be more tense, nor more smooth, and it would not appear forced down, but rather compressed; finally, as the ovum resembles a soft bladder, its inferior extremity is rather rounded than pointed, while the coagulated mass is more resistant and solid, is less compressible, and has, in general, the form of a cone, the enlarged extremity of which is above and the apex below.

Finally, if we should then attempt to move the uterus in its totality by pressing on this mass, it might be easily effected if there were a clot concerned, whilst the parietes of the ovum would yield, and would not transmit the motion to the organ which envelops it, and with which it is then but feebly adherent.

The question is therefore by no means simple, yet it is important to know whether pregnancy really exists; for as the appearance of the menses is then of very rare occurrence, especially when they are absent in the early months, a flow of blood should be treated as a serious accident, which, on the contrary, would be promoted, if attributable to a return of the courses. Notwithstanding these uncertainties, there may be a union of circumstances such as to allow of at least a probable diagnosis. Thus, if a woman, who has been habitually regular, finds her catamenia to stop suddenly and unaccountably; if this suppression is followed by other rational signs of pregnancy; if the pains continue notwithstanding the discharge of blood; if they appear as an effect of any violence whatsoever, or if they present anything unusual as respects either intensity or duration, it may be concluded that abortion is imminent. The diagnosis becomes more certain if the blood flows more profusely than in ordinary menstruation, if it is accompanied with sharper pains in the hypogastrium than is usual, if coagula are expelled, and if the orifice is sufficiently dilated to admit the extremity of the finger.

2. Pregnancy existing, may the symptoms be attributed to simple congestion of the uterus, or should they be regarded as the first tokens of a threatened abortion? Though it is very difficult to decide this question within the first three or four months, and at the beginning of the accident, its solution is happily of little importance as regards the treatment, the measures indicated by simple congestion being equally applicable to the prevention of miscarriage.

When symptoms, which in all appearance were due to simple congestion, have yielded to proper treatment, the physician is often required to answer a question whose rigorous solution is always impossible: namely, the abdominal and lumbar pains being allayed, and all the other alarming symptoms removed, is the patient therefore out of danger of miscarriage? In the majority of cases we can tell nothing about it, for it is impossible to know whether the congestion has been arrested in time to prevent a rupture of blood-vessels, and an effusion between the placenta and uterus, or whether the separation of the placenta is extensive enough to have destroyed the fœtus immediately; even supposing the child to be still living, we cannot ascertain the degree of separation of the placenta, nor foresee the effect which a partial destruction of its maternal attachments may have upon the fœtus. Very frequently, indeed, the latter, by being cut off from a considerable part of its means of respiration, is placed in the condition of an adult whose lungs are in great measure destroyed, and whose respiration and nutrition being insufficient, gradually wastes away, so the child often does not perish until after the lapse of eight days, two weeks, and frequently even not until the next menstrual period; this, too, without the appearance of any new symptoms to explain its unlooked-for death. The physician cannot therefore be too reserved in his diagnosis, as regards the possible consequences of such accidents.

3. Finally, supposing the abortion begun, can we hope to arrest the symptoms? The intensity of the pains, their constant direction from the umbilicus towards the coccyx, the previous duration of the discharge, and the amount of blood already lost, softening and dilatation of almost the entire neck, and even of the internal orifice, and projection of the membranes during the contraction, doubtless indicate a very unfavorable prognosis, though they should not destroy all hope. All these symptoms conjointly have in fact been known to yield to appropriate treatment, everything to resume the natural state, and the pregnancy to go on as usual. Some authors even state that the rupture of the membranes and discharge of the amniotic fluid does not render abortion inevitable. This last assertion, however, seems to me to be at least very contestable, for it is infinitely probable, not to say certain, that in the cases alluded to there has been a mistake in reference to the true origin of the waters lost by the patient. It appears to me that a rupture of the ovum must inevitably give rise to abortion; and Desormeaux has certainly confounded cases of hydrorrhœa with the true discharge of the amniotic fluid.

A young lady, who had already been so unfortunate as to miscarry in her first pregnancy, to be delivered of a dead child in the second, and finally, to have lost a little girl of six months, had advanced three months and a half in a fourth pregnancy. After returning from mass, in a church very near her dwelling, there was a sudden discharge of fluid from the genital organs, to an amount estimated by the patient at about a tumblerful. On first seeing her, I thought abortion inevitable. Then, upon a careful examination of the uterus, it seemed to me, that, notwithstanding the loss which had occurred, the organ presented its usual size, a certain elasticity, a peculiar suppleness showing that some fluid must still remain within the amniotic cavity; there was nothing peculiar in the state of the cervix; no flow of blood; neither was there pain before, during, or after the discharge of water. In acquainting the patient with the fears which I entertained, I also assured her that all hope was not lost, and that the circumstances just mentioned presented collectively features which do not usually appertain to ruptures of the ovum itself. Absolute quiet, a small bleeding from the arm, opiate enemata, and hand-baths, to be repeated morning and evening, were directed. No new symptoms supervened, and the development of the uterus continued. For the first two days, there was still a very small discharge of water. At four months and a half, and also without appreciable cause, there was a sudden escape of five or six spoonfuls of a fluid similar to the preceding. After this, nothing of the kind occurred until the end of her pregnancy, which terminated very happily. (See *Hydrorrhœa.*)

Abortion is really inevitable only when the fœtus has ceased to live, or when the separation of the placenta and the rupture of the utero-placental vessels are so extensive that the remaining utero-placental attachments are unequal to the support of the fœtal respiration.

In order to estimate the probable degree of disturbance of the utero-placental relations which has taken place, much more regard must be had to the amount of the discharge than to its duration. A simple exudation, or a moderate flow of blood, may continue for several days or weeks, since it may originate in the rupture of very few vessels; I have known it to last for six weeks and two months, without compromising the pregnancy; but that the patient should lose a considerable amount of fluid or coagulated blood in a short time, the placenta must be separated to a considerable extent, and abortion almost necessarily ensues.

There is still another peculiarity not mentioned by authors, which appears to me of importance, inasmuch as it cuts off almost all hope of arresting the progress of the symptoms: I allude to a particular form of the neck. When the patient has been for a short time only pregnant, we know that it is always easy to distinguish the neck of the uterus from its body; in the great majority of cases, we may even feel the angle which separates them. Now, when the contractions have lasted for a certain time, they have gradually dilated the internal orifice; the cavity of the neck has become confounded with that of the body, and when the finger in the vagina is passed over the entire lower segment of the uterus, the neck can no longer be distinguished from it; a well-defined limit between them is no more to be detected, and all that belongs to the neck of the womb has the shape of a pear, the larger part being continuous with the body of the organ, and the lower extremity corresponding with the external orifice. Whenever I have met with this condition of things, abortion has taken place. "The vagina itself," Dr. Coffin remarks, "is so far affected, that its upper extremity becomes rounded, the rugæ are effaced, and the finger meets everywhere a smooth and regular surface like that of a polished vase."

It is impossible to ascertain certainly in the early months, whether the fœtus be living or dead. I must, however, mention a peculiarity which in my estimation is of great value in reference to this question: namely, the sudden cessation of the vomitings, salivation, or any other sympathetic functional disorder of pregnancy. When, after an accident, vomiting and salivation cease, there is cause to fear that the child is dead, the persistence of these discomforts being on the contrary a favorable sign. Happily, though the uncertainty upon this point makes an exact prognosis impossible, it in no wise affects the treatment. Whenever, indeed, a collective examination of the general and local symptoms leads to the supposition that the child is living, and that we may hope to arrest the progress of the accident, we should act as though we were certain.

We see, therefore, that in the first third of gestation the diagnosis, at the best, can be only probable.

At a more advanced stage of gestation, the diagnosis is much more certain. First, because we can then generally ascertain the development of the uterus without difficulty; then, again, pains are more energetic; the blood flows in greater abundance, and the dilatation of the os uteri is more easily detected; but it becomes still more certain when the death of the fœtus can be verified in a positive manner. (See *Signs of the Death of the Fœtus*, page 558.)

ARTICLE IV.

DELIVERY OF THE AFTER-BIRTH.

The spontaneous expulsion or the extraction of the placenta presents very different phenomena according to the period when the abortion takes place; and, in this respect, it is highly important to distinguish the accident in the first two months from that of the third and fourth, as also from that of the fifth and sixth; for the ovum is usually expelled entire in the first and second months, but in the two latter the expulsion of the placenta is accomplished nearly in the same way as at term. But in the third and fourth months it is altogether different, because the placenta, which is already voluminous, has contracted at this period numerous and very intimate adhesions with the womb, which has not as yet acquired all the contractility of tissue that it possesses at term; consequently the premature contractions, although sufficiently energetic to rupture the ovum, are not adequate to the destruction of the utero-placental adhesions. Hence, under the influence of such contractions, the amniotic sac, being pressed on all sides, yields near the neck, the waters escape, the little fœtus is expelled, and the very delicate umbilical cord breaks easily; at the same time a certain quantity of liquid or coagulated blood is poured out, and very often the small fœtus is lost in the midst of the coagula that accompany its discharge. Then the uterus, being partially evacuated, retracts, the neck closes up, and the symptoms disappear; nevertheless, the placenta and membranes are still undelivered, and may remain in the womb for eight, ten, or twelve days, or even longer. Dr. Advena, of Labischin, reports an instance where the after-birth was not expelled till three months subsequent to the abortion, this latter having occurred at the fifth month of pregnancy. (*Journal de Chirurgie*, Aug. 1843.)

The complete closure of the neck evidently makes the introduction of the finger impossible, so that every attempt made for this purpose would prove fruitless. Ergot may, indeed, be administered with the object of exciting contractions, though I have never seen it have any good effects when given under these circumstances. To wait, at the same time watching carefully, is all that can be done.

The symptoms which may then result from retention of the placenta are very variable, and should be carefully studied.

1. Very frequently, nothing at all unusual is observed for a few days following the miscarriage. The general health is good; the patient, believing herself entirely cured, gradually resumes her ordinary occupations, when all at once, and without any known cause, some intermittent pains are felt in the hypogastrium, and a little blood escapes from the vulva. The woman often neglects these primary symptoms, but they persist and augment in intensity, thereby constraining her attention to them; for the placenta has become a foreign body in the womb, and, irritating the uterine walls by its presence, excites their contractions; these break up the utero-placental adhesions, and the after-birth is almost free in the uterine cavity. This separation is always accompanied by hemorrhage, which is at times very abundant, because the os uteri dilates with so much difficulty, to permit the foreign body to escape, that the latter, by remaining in the womb, encourages a hemorrhage by irritating the organ and preventing the complete contraction of its walls; insomuch that, if art does not seasonably interpose, life itself may be endangered by the great amount of the discharge. What is still worse, if the physician did not happen to be present at the time of the miscarriage, if he had not carefully examined all the clots himself, the attendants will not fail to tell him that the after-birth and the child were expelled together, and, should he pay any regard to their statements, he may possibly overlook the cause of the accident altogether. I have been summoned several times to such cases, and have invariably been told by the persons questioned that the placenta was delivered. Consequently, the accoucheur should rely exclusively on his own personal examination in such cases. He must absolutely touch the female, when he will usually find the os uteri to be partially dilated, and a portion of the placenta hanging in its orifice. It then is only necessary to seize this portion with the two fingers, for its extraction is, in general, quite easy. In case of necessity, Levret's abortion-forceps, Duges' placenta-crotchet, or Pajot's curette, might be used for this purpose.[1]

---

[1] This is a blunt hook, formed of a loop of iron or silver wire, of a line or more in diameter. The loop is narrow in proportion to the thickness which it is desired the hook should have, never, however, exceeding an inch and a half in width. It is curved near its extremity, so as to form a hook of the size required. The remainder of the

Sometimes the adhesions of the placenta are so numerous that it is impossible to destroy them, and extract the latter, even with Levret's forceps. It is then possible, by strong pressure upon the hypogastrium, to depress the womb, so that the forefinger of the other hand can be passed into its cavity, and glided between the placenta and the uterine walls. Lastly, if this does not succeed, the tampon must be resorted to, and the ergot administered at once; for the conjoint use of these measures rarely fails to arrest the hemorrhage, and bring on a sufficient degree of contraction to expel the secundines.

Such are the measures which should be resorted to, whenever the hemorrhage becomes dangerous either by its duration or abundance. When, however, it is arrested, especially when the placenta is partially engaged beneath the orifice, and seems to prevent, by its presence there, further discharge, we should wait, and be very careful how we attempt to extract it immediately. The engagement of the placenta in the cavity of the neck maintains in the latter a degree of dilatation likely to facilitate its complete expulsion, and besides exciting, as a foreign body, the sensibility of that part, also excites, or at least keeps up, the contractions of the fundus of the womb. Tractions upon the engaged portions might tear the placental mass at the point of constriction by the retracted internal orifice. Now, immediately after this partial extraction, the neck would resume its former condition, the internal orifice would close more or less completely, and render impossible the removal of the portion of placenta remaining in the cavity of the body of the uterus.

2. But matters do not always pass off so happily, and a retention of the placenta may give rise to the most serious accidents. In fact, it sometimes remains in the uterine cavity after having been separated wholly, or in part, and soon undergoes decomposition, just as though it were exposed to the air; the lochia become fetid; the uterine walls, being in contact with the substances in course of putrefaction, absorb a portion thereof, and, as a consequence, fever is developed, together with all the symptoms of a putrid infection. In these distressing cases, we should evidently relieve the womb from those foul materials that infect the whole economy; but, unfortunately, the neck of the uterus is completely closed, and an introduction of the finger thereby rendered impossible. Often, indeed, it is exceedingly difficult to make the extremity of a canula enter for the purpose of throwing detergent injections into the uterine cavity, and we are then compelled to await the complete expulsion of the excessively fetid sanious matters resulting from the decomposition of the placenta. In such cases, M. Velpeau speaks favorably of the use of ergot. This, indeed, is a remedy that might be used, but from which, nevertheless, we should not expect too much.

A lady, thirty-five years of age, whom I suspected to be pregnant, although she would not believe it, felt a discharge from the parts after a suspension of the menses for two months and a half, which she at first mistook for a return of her courses, but which, after riding out in a carriage, was suddenly

loop, which serves as a handle, receives the curvature necessary to facilitate the introduction and use of the instrument. It is directed into the womb by a few fingers, when it receives the soft mass in its concavity, and is then slowly drawn out. (*Dict. Méd et Chir.*, *en* 15 volumes.)

converted into a profuse flooding. Having been summoned immediately, I found the os uteri slightly dilated, and I forthwith employed various measures adapted to the arrest of the discharge, and among others the ergot. The hemorrhage gradually diminished, and at ten o'clock P. M. (six hours subsequent to the invasion of the symptoms) it had entirely ceased. During the first five days the patient did very well, but on the sixth I thought I detected a slight odor in the lochia, and at three o'clock in the afternoon a violent chill came on, which lasted an hour. From this moment all the phenomena of absorption were manifested. I immediately administered forty grains of the ergot, but without effect, for nothing came away; and notwithstanding the enlightened efforts of Messrs. Chomel and Moreau, who were several times called in consultation, this unfortunate lady died on the tenth day following the appearance of the first symptoms. At the *post-mortem* examination we found the uterine tissue softened, and its cavity filled by the putrefied and still adherent placenta, which we could not separate without tearing.

3. It may further happen that the placenta, maintaining its vascular adhesion with the internal surface of the organ, continues to be developed after the child's death, the cord and fœtus become atrophied, and then completely destroyed; or, indeed, the ovum may rupture, and the little product escape, leaving the membranes behind. These envelopes may undergo various modifications, but the most common is the morbid product known as a fleshy *mole*. It has been generally conceded, since the researches of M. Velpeau on the subject, that moles which are expelled from the uterine cavity are merely the remains of an altered product of conception.

4. Lastly, there is yet another mode of termination, admitted by Nægèle, Osiander, &c. I allude to the absorption of the placenta retained in the cavity of the womb; for although such an absorption has been observed even after delivery at term, yet most of the reported cases refer especially to miscarriages. (See *Delivery of the After-birth.*)

ARTICLE V.

PROGNOSIS.

The prognosis of abortion is necessarily variable, according to the time of its occurrence and the cause which has produced it. As regards the fœtus, it is always mortal, since the expulsion takes place before the product of conception is fitted for an extra-uterine life, though I am well aware that cases are reported of children, born prior to the period of viability fixed by law, which have lived; but these examples, even were they authentic, are too rare to invalidate the general proposition just laid down.

As regards the mother, the prognosis is said to be more grave than that of labor at term; but this proposition, which has been advocated since the days of Hippocrates, requires explanation, and should not be received without some restriction; for the prognosis, considered in relation to immediate consequences, is certainly less serious in a case of abortion than in a natural labor; but the remote effects are undoubtedly more disastrous in the former case. Thus, the acute diseases which attack lying-in women are more frequent after labor, whilst the chronic disorders of the genital organs which appear in advanced age are more common with females who have often aborted than with those who have always been delivered at term.[1] Again, it is highly important to notice the unfavorable influence that one abortion seems to have over subsequent pregnancies; for whenever a woman has had a miscarriage, she is more predisposed than others to a similar accident, and hence great precautions should always be taken to prevent it.

The period at which an abortion occurs also influences the prognosis, although we cannot exactly say, with Desormeaux, that it is more serious for the patient in the advanced stages of gestation. Doubtless, as before stated, it scarcely constitutes an indisposition in the first or even the second month; but in the third or fourth, the expulsion of the fœtus demands a certain dilatation of the os uteri, and tolerably energetic contractions; for the neck and body of the uterus have not as yet undergone the modifications necessary to such an effort, and the delivery of the after-birth often presents difficulties less frequently met with at a more advanced stage of gestation; whence I conclude, that an abortion is then more grave and painful to the patient, as also more dangerous, than in the fifth or the sixth month.

Lastly, the prognosis varies with the cause of the accident. Thus, the most serious of all is an abortion brought on either by medicines administered internally or by manipulations; while a miscarriage determined by slow and gradual influences is usually attended with less danger than one caused by external violence or some powerful moral commotion. In this latter case, the hemorrhage which precedes, accompanies, or follows the abortion, is nearly always much more serious. Lastly, when it occurs in the course of an acute inflammation of an important organ, or during the existence of an acute disease of the skin, it is exceedingly dangerous.

ARTICLE VI.

TREATMENT OF ABORTION.

The treatment of abortion consists in preventing it, in favoring the expulsion of the ovum when this is inevitable, and in remedying the various accidents that may complicate it.

1. *Preventive Measures.*— When the miscarriage is dependent on the woman's bad constitution, or on a lesion of the genital organs, we must endeavor to combat and destroy this pernicious predisposition, more especially in the intervals between the gestations. I shall say nothing at this time of the means of modifying the general vices of the constitution, since they necessarily vary with the nature of the affection. It is particularly important, however, to bear in mind the disastrous influence of syphilis, whether the father or the mother be infected with it, over the life of the fœtus; and we should persuade them to submit to a mercurial course.

---

[1] Would it be unreasonable to suppose that, inasmuch as women who have had frequent miscarriages are particularly liable to chronic diseases, the tendency may be due to the fact that they have long borne the germ which occasioned their previous abortions? Which was the cause and which the effect? (Blot.)

When it happens that several abortions have resulted in consequence of some displacement of the uterus, the latter should be remedied by the appropriate measures: for instance, in the commencement of pregnancy, the woman should avoid all fatigue and every violent effort; and it is even advisable for her to remain in the recumbent position until the uterus rises above the superior strait.

We award the proper value to the influence attributed by Desormeaux to the supposed rigidity and excess of sensibility or contractility in the uterine fibre, as well as to the excessive weakness or relaxation in the fibres of the neck. But, whilst interpreting the action of those causes in a different manner, we believe, with him, that bathing, general bleeding, opiate injections, and a regulated course of living, are the means best suited to moderate this great irritability of the organ; and that a tonic and strengthening regimen, aided by the ferruginous preparations, cold baths, and the chalybeate mineral waters, will be the most usefully employed in those cases where the general debility of the patient may have seemed to exercise some influence over her former abortions.

Plethoric women, who usually have profuse menstrual discharges, and who may have previously suffered from abortion at the periods of menstruation, all of which had been preceded by the symptoms of general or local plethora, and all followed by more or less copious discharges, should be subjected before fecundation to a restricted regimen; and during gestation, they should avoid all moral and physical excitements, and should remain in bed eight, ten, or even twelve days at every monthly term; besides, they ought to be bled several times during the earlier periods of pregnancy, more especially just before the time for the menses to appear.[1]

These, more than other pregnant women, should renounce the use of corsets, which, independently of the restraint they make on the development of the breasts, oppose the free return of blood, by interfering more or less with the abdominal and thoracic circulation, and thereby favor congestion of the inferior organs.

Feeble, cachectic females, who are impaired by former diseases, and those whose tissues are soft, and their circulation languid, or who, from being habitually irregular, are affected with chronic leucorrhœa, are often attacked by hemorrhages during pregnancy which ultimately lead to an abortion.

In such patients the face is pale, the pulse soft, small, and irritable, the tongue white, digestion painful, the intestines torpid, and the extremities cold. The least exercise fatigues them, sometimes even exhausts their strength. The fatigue is often accompanied by a sensation of weight, of painful draggings in the groins and lumbar regions, and, should they remain standing for any length of time, the uterus seems to require some support, as it appears just on the point of escaping by the vagina or rectum. Even in the earliest stages, they feel something like a weight in the lesser pelvis, always pressing on the most dependent part.

---

[1] The physician often meets with much opposition from persons out of the profession when he proposes a preventive bleeding in the early stages of gestation. Particularly, should any accident happen shortly afterwards, they would not fail to reproach him with it. This, however, is no just reason for not acting according to his convictions, or for yielding in cases where he believes it really useful; now experience has fully proved that, in such instances as those we have described, it is one of the best preventive measures.

Now, the best mode of preventing such a condition, is to prescribe a tonic regimen, together with the ferruginous and bitter preparations. Canella, in powder, has been recommended; and Sauter highly extols the use of powdered savine; he asserts, that he has succeeded in correcting this pernicious predisposition in pregnant women, who had previously had several miscarriages, by administering fifteen grains of the powder three times a day, continuing it for three or four months; by this remedy he has arrested flooding and prevented abortion, and many patients can attribute the fact of having children born at full term to the employment of this precious drug.

White, of Manchester, has particularly recommended cold bathing, especially sea-bathing, to be often repeated, both before and during pregnancy.

The accoucheur must therefore search in the history of former miscarriages for the indications to guide him in the use of preventive measures; and it is likewise very important that he should make himself acquainted with all the accompanying circumstances.

Pregnant women are very often constipated, and this constipation frequently becomes the cause of periodic abortions, by the irritation it produces; hence, it should be prevented by the use of some simple injections, with the addition of one or two tablespoonfuls of linseed-oil, regularly, every other day, for two weeks before the period when the abortion occurred last time, and they ought to be continued for two weeks after it.

But whatever may have been the predisposing cause whose influence was exerted in the previous pregnancies, there is one very important precaution, the neglect of which might render all others useless. In all cases where abortion has occurred several times, it is indispensable that the organ should remain undisturbed, and the husband be recommended to allow from six to eight months, or even a year to elapse, without the wife being exposed to become pregnant.

When this accident has already occurred a number of times in former pregnancies, it is always indispensable for the woman to abstain altogether from intercourse with her husband, for all sources of irritation must evidently be withdrawn from the womb. Again, if the fœtus was expelled dead in the preceding gestations, and this death had been caused by some lesion of the ovum, it is almost impossible to recognize, and consequently to prevent, a similar alteration.

The case is rather different when the previous abortions have been attributed to utero-placental or intra-placental effusions, for these are almost always the result of a congestion of the uterus, of sufficient intensity to produce a rupture of vessels. In another pregnancy, it might be possible to avoid such accidents. We would, however, call attention to the fact, that these local congestions may occur in chlorotic as well as in plethoric women, and consequently, that, although revulsives applied to the upper part of the body, or to the superior extremities, are useful in all, bleedings from the arm at the menstrual periods are very advantageous with the latter, whilst the former are benefited by the preventive use of ferruginous preparations, administered from the commencement of gestation.

Under some unfortunate circumstances, nature seems to deride all the attempts of art, and abortion reoccurs. Still, we must not despair when the woman becomes again pregnant, for experience fully proves that, notwithstanding numerous former abortions, a fresh pregnancy has sometimes succeeded in reaching full term. Dr. Young (*Rigby*, 91) relates, in his lectures, the history of an unfortunate lady, who, after having had thirteen successive abortions, became pregnant for the fourteenth time, and was happily delivered of a living infant at term.

But, notwithstanding all these precautions, it sometimes happens that an abortion is threatened. The patients are affected with shiverings from the most trifling causes, pains in the hypogastrium, loins, &c.; uterine contractions appear, the sexual parts become moist, and occasionally even the os uteri dilates; but even here we must not lose all hopes of arresting the accident, notwithstanding those symptoms.

If the patient is robust, the pulse full and frequent, more especially if the development of the symptoms had been preceded by indications of plethora, bleeding in the arm should be at once resorted to, the woman be laid as horizontally as possible, and opiates immediately administered. The laudanum of Sydenham may be given in the dose of twenty, forty, or even sixty drops, diffused in a small quantity of some mucilaginous liquid as an injection, and repeated at intervals of an hour, until the contractions disappear. This remedy, of which we have before spoken, is one of the most efficacious in cases of this kind, and sometimes it alone has enabled us to arrest a labor whose termination seemed to be inevitable, and thus has permitted the gestation to pursue its regular course.

I cannot refrain from citing the following instance in illustration. A woman, advanced to three months and a half, was taken with pains in the abdomen and loins, after a violent altercation with her husband; on the following day the pains augmented, and a little bloody fluid escaped from the genital organs; the pains still continuing, and the discharge having somewhat increased, on the third day the patient came on foot to the Clinique. I found on her arrival that the uterine contraction was very distinct, the pains sharp, and renewed every eight or ten minutes; pure blood was discharging from the vulva, and the orifice was sufficiently dilated *to permit the finger to pass readily as far up as the naked membranes*. I administered sixty drops of laudanum, divided into three doses, which were given at intervals of three quarters of an hour, and by the end of this time the pains disappeared, everything resumed its natural order, and the gestation went on till full term.

I might multiply such citations almost *ad infinitum*, but the above is sufficient to show that, however inevitable the abortion may at first appear, we should never abandon all hopes of preventing it. I may add, that the administration of opium in the doses just indicated, or even carried to a hundred drops in the twenty-four hours, has never been followed by serious consequences. Sometimes, perhaps, a little somnolency or heaviness about the head, or a general torpor may result, but which a few glasses of lemonade will soon dissipate. For, after all, when even death of the fœtus must have been either the cause or the effect of the primary symptoms, what do we risk in calming or arresting the uterine contractions? because, as we have already seen, the dead child may remain long within the intact membranes without any unfavorable consequences resulting to the mother. And besides, as it is almost impossible to ascertain its death with any degree of certainty prior to the fifth month of gestation, we must act in such doubtful cases just as if it were living; although there cañ be no question that, if the fœtus were really dead, it would be better to permit the contractions to go on, and its expulsion to be effected. But, even supposing these are wholly suspended, the expulsion is somewhat retarded, and that is all; for after the lapse of a certain time the fœtus, acting like a foreign body in the uterine cavity, will irritate its walls, and a new labor sooner or later take place in consequence.

To these remedies (the venesection and opiate treatment) we must add strict confinement to bed, absolute rest of mind and body, the use of demulcent beverages, cold lemonade, veal-broth, chicken-water, and the application of cold compresses, frequently renewed, over the abdomen; which compresses are to be saturated with some fluid whose temperature is progressively lowered. "Local bleedings," says M. Gendrin, "are too much neglected, especially in the treatment of the utero-placental hemorrhages; indeed, we have so often had occasion to congratulate ourselves for having advised them in those cases, that we now prescribe them with great confidence whenever the general condition does not directly indicate a depletory venesection. We direct them: 1. When there are any sharp pains in the neighborhood of the uterus or groins, and we apply them to the latter, the anus, or even the vulva; 2. In cases of a considerable turgescence of the hemorrhoidal tumors (if any such exist); and 3. In the phlegmasia of the adjacent organs, such as the large intestine, &c."

In these two latter cases we fully coincide in the opinion of M. Gendrin; but, in the first, we should much prefer having recourse to a general bleeding in the arm, or, as he himself advises, further on, to the application of leeches at a distance from the uterus: for instance, near the breasts, armpits, &c., &c. Finally, to the means already enumerated, we must further add the use of irritant revulsives, placed upon the upper part of the trunk and the thoracic extremities, and must also recommend in a more special manner the application of dry cups, the decidedly beneficial effects of which we have often witnessed in cases where uterine plethora seemed to be the cause of the symptoms, but where the general condition required some precaution in the use of blood-letting.

2. It has been already stated that a copious hemorrhage, intensity of the pain and of all the other phenomena, and more particularly a rupture of the membranes, render abortion thenceforth inevitable; and hence, the only course in such cases is to facilitate the expulsion of the product of conception. But still, if the hemorrhage is not of such a character during the first three months of gestation as to compromise the woman's life, the physician should remain a simple spectator of the efforts of nature, and confine himself to superintending the progress; for the expulsion of the ovum ought to be left entirely to the uterine forces. Sometimes it comes away whole, which is a very favorable circumstance. Moreover, according

to the recommendation of Baudelocque, he should be very careful not to rupture the membranes, for that would only retard the delivery of the placenta, and render it still more dangerous. In fact, when the fœtus escapes alone, this latter might be attended with the difficulties pointed out in one of the preceding articles.

We should here remember how slowly the expulsion of the ovum is effected in certain cases, even when the orifice is sufficiently dilated to oppose no obstruction to its exit. This great slowness is sufficiently explained by the slight contractile power of the uterus. When no accident complicates the abortion, the physician has nothing to do but watch the progress of the labor, and expect the complete delivery to be effected by the uterine efforts. At a more advanced period, that is, towards the fifth or the sixth month, the course of the physician is very nearly the same as it would be at term. The size of the fœtus, which has now become quite large, requires a greater dilatation of the os uteri; and this, in consequence of the greater softening of the cervix, is accomplished with somewhat greater rapidity. Generally, it is necessary that the child should present one or the other extremity of its long diameter to the os uteri; however, it sometimes happens that some portion of its trunk presents there, and its delivery is neither much more difficult nor much slower than usual. It is in such cases especially that the mechanism of spontaneous evolution may be frequently observed. The delivery of the after-birth does not, as a general rule, exhibit those difficulties which it presented in the earlier months; in truth, it closely resembles the same process in the labor at term.

3. Hemorrhage is not only one of the most common symptoms, but it may follow the expulsion of the fœtus, and become the most serious feature of the case.

Whenever, notwithstanding the use of general measures, such as the horizontal position, cold drinks, the application of refrigerants to the hypogastrium or thighs, and the administration of opiates, the discharge of blood continues so great as to endanger the mother's life, an abortion thenceforth becomes inevitable, and the primary object of the accoucheur should be to bring on the contractions and the evacuation of the organ.

He should also administer general stimulants to sustain the woman's strength, and, at the same time, those medicines having an immediate action on the womb itself, such as the tincture of canella, &c., but above all the ergot. However, when the miscarriage comes on at an early stage of the gestation, these measures are often ineffectual, for it is then exceedingly difficult to excite the contractions of a viscus whose muscular organization is still so imperfect; or at least, if they are aroused, they are frequently inadequate to dilate the neck sufficiently. The tampon is then the only resource; this, when well applied, acts in two ways: 1st, by opposing the escape of the blood externally, thus forcing it to coagulate, and consequently to obliterate the bleeding vessels; 2d, by irritating the womb by mere contact, thereby determining its retraction, and the expulsion of the product of conception. This circumstance, indeed, is one of the best-founded objections to the use of the tampon in the early months of gestation. But, in truth, is it not rather an advantage than otherwise? because the cessation of the flooding is always a necessary consequence of th uterine contractions; and is the mother's life bought too dear, when it is saved by the expulsion of a fœtus which, in most cases, is dead even before the application of the tampon? Besides, this measure is not always necessarily followed by abortion. Again, there is no reason to fear the conversion of an open into a concealed hemorrhage by the employment of the tampon, before the sixth month; for, notwithstanding the observation of Chevallier, the accumulation of a large quantity of blood in the womb would seem to be impossible at this early period, without supposing an abnormal relaxation of its walls. Where, however, the pregnancy is advanced to the fifth month, the accoucheur should carefully watch the body of the uterus after the tampon is applied, and assure himself, every moment, that its volume is not increasing.

We shall describe hereafter (see *Operations*) the mode of applying the tampon, but it should be remembered that its use is almost always followed by abortion, and that it should be had recourse to only when the latter seems to be inevitable.

When the ovum remains intact, and the labor lasts too long, the continuation of the hemorrhage being at the same time such as to cause serious anxiety, some practitioners prefer rupturing the membranes to applying the tampon. This measure, to which I shall again allude in speaking of hemorrhage during the last three months, does not seem to me applicable before the sixth month, except in a few occasional instances, and I should, in general, decidedly prefer the tampon to it.

In fact, a rupture of the membranes is necessarily followed by miscarriage; but the tampon, when early applied, leaves some hope that the gestation may continue till term; again, the tampon always arrests the bleeding, whereas, after rupturing the membranes, it may happen that the uterus, whose muscular fibres have not acquired the contractile power which they would have at a later period, might not retract, nor the hemorrhage cease, so that it might still be necessary to have recourse to the tampon.

Finally, let us add that, in the first three months, the rupture is followed almost immediately by a discharge of the waters and the escape of the fœtus; but the expulsion of the placenta and membranes is thereby rendered much more difficult.

After the complete expulsion of the ovum, the patient must observe the same precautions as are required after ordinary labor.

CHAPTER VI.

OF EXTRA-UTERINE PREGNANCY.

The fecundation, as elsewhere stated, most frequently takes place in the ovary, and the impregnated ovule is then received by the fimbriated extremity of the tube, which applies itself on this organ, doubtless by a kind of spasmodic contraction. Having been once deposited in the tubal canal, the ovule traverses its whole length, and falls into the uterine cavity, where its development continues until term. Such is the course observed in normal or *uterine pregnancy;* but it may happen that the ovule is arrested, or diverted, in the route it thus travels, and ingrafting itself, so to speak, upon the point of stoppage, is there developed; in the latter case, the pregnancy is called an *abnormal,* or an *extra-uterine* one.

This species of gestation has been subdivided into several varieties, which have received different names, according to the part of the passage where the ovule becomes fixed. Dezeimeris admitted the following divisions, namely:

1. Ovarian pregnancy.
2. Sub-peritoneo-pelvic pregnancy.
3. Tubo-ovarian pregnancy.
4. Tubo-abdominal pregnancy.
5. Tubal pregnancy.
6. Tubo-uterine interstitial pregnancy.
7. Utero-interstitial pregnancy.
8. Utero-tubal pregnancy.
9. Utero-tubo-abdominal pregnancy.
10. Abdominal pregnancy.

Such was the classification which, in an anatomo-pathological view, was adopted in the six first editions of this work. We now think it would be better to make a more simple arrangement, and shall, accordingly, describe but five varieties of extra-uterine pregnancy:

1. Abdominal pregnancy.
2. Tubo-abdominal pregnancy.
3. Tubal pregnancy.
4. Interstitial tubo-uterine pregnancy.
5. Utero-tubal pregnancy.

1. *Abdominal Pregnancy.*—To render fecundation possible, it is necessary that there should be direct contact between the sperm and the ovule, and, consequently, that the Graafian vesicle should burst into the abdominal cavity of which it, for the moment, forms a portion. But, should the fecundated ovule, instead of engaging in the tube, remain in the just ruptured ovisac and be retained at the surface of the ovary, or fall into the peritoneal cavity, its development gives rise to an extra-uterine pregnancy which we shall designate under the general name of *abdominal pregnancy.* Three varieties of this class will be recognized: in the first, the fecundated ovule is still contained in the just ruptured ovisac, and is developed upon the spot: the pregnancy is then styled *internal ovarian.* In the second variety, the fecundated ovule, having escaped from the Graafian vesicle, adheres to the surface of the ovary, where it undergoes development: this is called *external ovarian* pregnancy. Finally, should the ovule, after leaving the ovary, attach itself to some part of the peritoneum, it receives the name of *peritoneal pregnancy.*

In *internal ovarian* pregnancy, the ovum is developed within the ovary itself. This variety has given rise to numerous scientific discussions, inasmuch as it was for a long time admitted that the ovule could be fecundated without previous rupture of the Graafian vesicle. Amongst the observations pleaded in favor of this hypothesis, one related by Bœhmer ought to be mentioned. He describes with much care both the membrane proper of the ovary itself and its peritoneal envelope. M. Velpeau, however, very justly observes that it is often extremely difficult to determine precisely the point of departure of the tumor; therefore we admit with him that, in this species of pregnancy, the ovisac is always ruptured. If the minute wound resulting from it be not evident when the dissection is made, it is because it has been obliterated by the process of cicatrization and the production of a newly-formed membrane.

External ovarian pregnancy cannot be doubted. It is, relatively speaking, quite common, and the fecundated ovule retains its intimate connections with the ovary upon which it is applied whilst undergoing development in the abdominal cavity.

Peritoneal pregnancy was for a long time contested, but is now supported by so great an array of facts, observed both in women and animals, that it is impossible to deny its occurrence. It has, doubtless, often been confounded with the ovarian and other forms, but in several published cases there can be no question that the ovum had no connection with the internal generative organs. M. Dezeimeris makes two varieties of this form of pregnancy, viz.: *primitive* and *secondary*. In the former, the product of conception has never been located elsewhere than in the peritoneal cavity, into which it fell on quitting the ovarian vesicle; in the latter, on the contrary, the first development of the ovule took place in the ovary, the tube, or the walls of the uterus, but at a later period extreme distention or pathological alteration of the walls of the tumor caused their rupture, and the ovum being partly or wholly expelled from the containing cyst, became lodged in the cavity of the abdomen, where it was at last found. The secondary abdominal pregnancy of M. Dezeimeris is, therefore, merely a tubal or interstitial pregnancy, ending in rupture of the primitive cyst. Whether, therefore, this rupture occurs at a very early period or at the regular term of gestation, it deserves to be regarded merely as an epiphenomenon, and can, in no case, constitute a distinct variety. We apply, therefore, the name *peritoneal pregnancy* to that form in which, from the very outset, the ovule has become adherent to some part entirely distinct from the internal generative organs. The points at which it may thus attach itself are extremely numerous, so that the placenta has sometimes been found inserted upon the peritoneum, covering the right or left iliac fossa, sometimes to the mesentery, or to a part of the small and large intestine, and sometimes, finally, to the anterior wall of the abdomen.

Most of the cases described by Dezeimeris as *sub-peritoneo-pelvic* pregnancies belong, we think, to the peritoneal variety. The author applies the former name to cases in which the ovule was unable, after leaving the ovary, to engage in the external opening of the tube, but slipped between the two layers of the broad ligaments and was developed there. According to his view, the ovum here is outside of the peritoneum, and remains principally in the pelvic cavity. Cases of the kind, he thinks, are not rare, and, on account of the situation of the ovum, are to be reckoned amongst the least dangerous. The position is, indeed, remarkably favorable to the spontaneous expulsion of the débris of the fœtus, or makes them easily accessible in case it should be thought necessary to abstract them. Whilst accepting this prognosis, we think that Dezeimeris is in error as regards the slipping of the ovule between the two layers of the broad ligament; it seems to me impossible that it should follow this route. The observers were, in these cases, deceived by the fact that upon opening the abdomen the peritoneum of the lesser pelvis seemed to be raised by a subjacent tumor. The appearance, however, misled them, for the tumor is not, really, covered by the peritoneum, but by a newly-formed false membrane, which soon acquires the shining and polished appearance of a serous membrane, and which blends, without a well-marked line of demarcation, with the surrounding peritoneum. If this pseudo-membrane be incised, a careful dissection will reveal the true peritoneum below the fœtal cyst. The tumor, therefore, is not extra-peritoneal, but intra-peritoneal. In short, the same phenomenon occurs here which for a long time sustained the idea that retro-uterine hematocele was seated outside of the peritoneum.

2. *Tubo-abdominal Pregnancy.*—It is evident that, if the tube be obliterated near the enlarged extremity, the ovule which has scarcely entered its canal will be arrested; and if the development occurs at this point, the tubal walls will necessarily be dilated, and one portion of the surface of the ovum be free in the abdominal cavity; to this variety the name of *tubo-abdominal* is applied. The placenta is attached in the interior of the tube, and the fœtus developed in the abdominal cavity, and both are surrounded by a cyst, the walls of which are partly made up by the parietes of the tube.

We include in the tubo-abdominal pregnancies those cases which have been described under the name of *tubo-ovarian.* In this the cyst, which surrounds the fœtus, is formed partly by the ovary, and partly by the opening of the dilated tube, whose extremities have contracted some adhesions with the ovarian tunic.

The following case of Dr. Jackson's is justly quoted by M. Dezeimeris as serving for a type. A woman, aged thirty-two years, was seized, in consequence of a violent blow on the epigastrium, with some inflammatory symptoms, to which she speedily succumbed; at the autopsy, a large quantity of blood was found diffused in the abdomen, and a fœtus of about ten weeks was found enveloped in an enormous clot; the fundus uteri rested against the pubis, and its cervix near the middle of the sacrum. This change from its natural position had been produced by a tumor situated on the left side of the womb, which tumor was formed by the ovary, the Fallopian tube, and the broad ligament, that had become considerably thickened and modified in their structure; the fringed extremity of the tube adhered intimately to the ovarian envelope, and a cyst was formed by these two organs, whose distention by the body contained therein had produced the rupture.

In another case, related by Bussières, which seems to me equally conclusive, the tube on the right side was extremely dilated at the extremity; and this dilatation, which was an inch in its largest diameter, extended for rather more than an inch and a half in length, gradually diminishing as it approached the womb. The portion of the tube thus dilated was curved on itself, and embraced nearly the whole ovary, to the membrane of which it was so adherent that it could not be separated without rupturing the attachments. An unctuous, limpid fluid escaped as soon as it was opened, and then the ovum appeared, which was about the size of a hazlenut, and was surrounded by the liquid; three-fourths of it had already escaped from the hole made in the ovary, so that it no longer seemed to rest there; yet, on attempting its removal, it was found attached by a hard pedicle covered with blood-vessels.

3. *Tubal Pregnancy.*—This is the most frequent of all the varieties of extra-uterine pregnancy; which fact is readily accounted for by the length and narrowness of the canal, and by the adhesions and morbid obliterations presented by its walls. Under such circumstances, the ovule is arrested and developed at some point between its abdominal extremity and the spot where it enters the uterine parietes; and by its continual growth distends enormously the fibres of the tube which constitute the envelope of the fœtal cyst. To the numerous cases of this kind reported by Velpeau and Dezeimeris, I might add another, already published by me in the *Bulletin de la Société Anatomique*, but so many examples are everywhere met with that it seems useless to reiterate their details. Dr. Lesouef's thesis may be advantageously consulted on this point.

4. *Interstitial Tubo-uterine Pregnancy.*—In this case the ovum is arrested in that part of the tube which traverses the thickness of the uterine walls; and although this is its principal characteristic, two varieties have been made of it, of which we shall say a few words.

In the first variety the walls of the tube, yielding to the distention occasioned by the development of the ovum, press back the surrounding tissue proper of the uterus, but always form the most internal layer of the cyst in which the product of conception is enclosed.

In the second variety the ovule reaches that part of the tube which traverses the uterine walls; but having arrived there, it opens a way through the tubal parietes, penetrates into the midst of the fibres of the womb, and thenceforth has no further relation with the tube; hence, the surrounding cyst is formed by the muscular fibres of the womb alone.

After having been once located among the uterine fibres, the ovum may either take an inward or an outward direction, and consequently may become seated near the mucous layer, or else to the peritoneal coat. In a preparation belonging to M. Pinel Grandchamp, the volume of the uterus was about the same as at six weeks or two months of pregnancy; at its left angle, a small tumor, slightly ruptured behind, constituted the cyst containing the product of conception. The tube, which passed behind it, communicated with it by an almost microscopic orifice, and presented nowhere any increase of calibre. The cyst was about large enough to contain an almond.

5. *Utero-tubal Pregnancy.*—Notwithstanding the free communication existing between the tube and uterine cavity, there is no absurdity in the supposition that the ovule may become deposited in a little depression of the mucous membrane, and there stop and ingraft itself, just at the internal orifice of the canal. In this case, phenomena similar to those of the tubo-abdominal gestations will arise: that is, the ovule, which may have con-

tracted some intimate adhesions with this extremity, may, by its development, encroach upon the uterine cavity itself; and I do not hesitate, therefore, to consider this variety of gestation as possible.

It is probable that certain singular cases described by Dezeimeris under the name of utero-tubo-abdominal pregnancies belong properly to tubo-uterine pregnancies. In this variety, examples of which have been furnished by Patuna, Hunter, and Hoffmeister, the fœtus is found in the abdominal cavity; the cord leaving the umbilicus enters the Fallopian tube, traverses its whole length, and is inserted in the placenta, which itself is attached to the internal surface of the uterus. However extraordinary these facts may appear, I think that no one can doubt them after reading the subjoined case, taken from the memoir of M. Dezeimeris.[1]

---

[1] Helen Zopp, aged 35 years, had been married for twelve years, and had given birth to eight children, two being twins.

As she was preparing for church on Sunday, July 10th, 1763, she was suddenly attacked, after a violent fit of anger, with a profuse flooding and the pains of childbirth (being then at term); however, she did not pass the waters, but what proved to be pure blood; and she felt the motions of her child up to the last moment. The midwife, summoned on the occasion, declared at once that the accouchement was at hand; but after the lapse of several hours, as the loss of blood continued without any positive signs of an approaching delivery, a physician and a surgeon were simultaneously sent for, the former of whom soon arrived, and recognizing at once the imminence of the danger, he ordered the administration of the sacraments, at the same time prescribing divers remedies for the discharge. The venesection of the cephalic vein was followed by a profound syncope, without causing the least abatement of the metrorrhagia; and the sacraments had scarcely been administered, when the patient died, at 11 A.M. on the same day.

Patuna and his father (the public surgeon to the city) arrived just as she was expiring. After assuring himself of her death, he immediately made a Cæsarean section upon the right side, where the abdomen offered the most resistance, and, as soon as the ventral walls were divided, an enormous fœtus, resembling a child nine months old, presented itself; the position was such that its back corresponded with the abdominal parietes of the mother; the head was somewhat inclined, was directed towards the vertebræ, and rested immediately under the diaphragm; the knees flexed towards the head, the right hand upon the thighs, and the left near the navel: the umbilical cord was of considerable length; it ascended to the right, wound around the neck, and then entered the Fallopian tube on the right side. A case of extra-uterine pregnancy being new to Patuna, although acquainted with most of the published examples, his researches were made in the most careful manner.

Having enlarged the opening made in the abdomen, so as to examine its cavity to better advantage, he sought for the fœtal envelopes with all possible attention, but in vain; for he neither found the amniotic liquid, nor fluids of any other kind in this cavity. By tracing the umbilical cord with his hand, he found that it penetrated into the right tube at the distance of a finger's breadth from the uterus; the uterine portion of the tube was more voluminous than that part which ran to the ovary, whence he judged that the cord passed through the former into the womb.

This organ was larger than the fist, and had the natural pyriform shape, but not the least vestige of any rupture; not the smallest cicatrix could be seen, and it hardly rose above the pelvis.

These observations being concluded, Patuna incised the tube from the entrance of the cord towards the uterus: this presented nothing peculiar, excepting the adherence to the cord where the latter perforated it. The uterus was then opened, and exhibited no trace in the interior of any previous laceration whatever; the walls were an inch and a half in thickness, and their substance was nearly bloodless; the placenta was

We explain them by supposing the existence of a tubo-uterine pregnancy ending in rupture of the tube with passage of the fœtus into the peritoneum, whilst the placenta remains in the uterus. The cord traverses the tube in its passage from the fœtus to its placenta.

We have not been able, from the restricted limits of this chapter, to bring forward a larger number of cases, but sufficient has been said to furnish an idea of the importance that ought to be attached to the different varieties of extra-uterine pregnancy admitted by us.

The reader may consult with benefit the article of Professor Velpeau, in the fourteenth volume of the *Dictionnaire de Médecine,* the learned memoir published by M. Dezeimeris, in the fourth year of the *Journal des Connaissances Medico-Chirurgicales,* and the able articles of Messrs. Breschet, Menière, and Guillemot.

The physiological and pathological history of these different pregnancies is yet to be given, and we shall therefore commence with their pathological anatomy.

§ 1. Pathological Changes.

The anatomo-pathological examination of extra-uterine gestations evidently comprises the peculiarities offered both by the product of conception and the parts of the mother.

A. *Product of Conception.*—In these pregnancies the ovule has its proper membranes, the chorion and the amnion. I may state that I was utterly astonished to hear several honorable members contend, in a recent discussion before the Academy of Medicine, that the envelope of the ovule, in abdominal gestations, was only composed of the amnios, and that no chorion existed; for although, in certain very old pregnancies, the most exterior fœtal membrane is confounded with the walls of the cyst, it is not fair to conclude from thence that it did not exist at the commencement.

Indeed, it is only necessary to recall our remarks on the mode of development of the ovum, to comprehend that the absence of the chorion supposes that of the allantois, and without the latter no circulatory relations can be established between the embryo and its mother.

The structure of the walls of the cyst varies according to the species of extra-uterine pregnancy. In the tubal variety, they are formed by the walls of the tube itself, and in the internal ovarian, by the integuments of the ovary.

found within adhering to a narrow space at the fundus, a little to the right; it extended more towards the left, but was there detached. It was about two fingers' breadth in thickness, and four inches in diameter, and it commenced very near the uterine opening of the right tube, and adhered more strongly there than at any other place. The extremities of some vessels were evident both on its convex surface and at the fundus uteri upon which it was ingrafted; its concave face, from the middle of which the cord arose, was covered by two membranes: one, the interior, being thicker and vascular, while the exterior was very thin and translucent; but these joined when they approached the border of the placenta, forming there a more solid substance, and having some very delicate vessels ramifying through it. The internal uterine orifice would hardly admit the little finger.

Everything else remained in a natural state, excepting the change in the situation of the intestines. (Barthelemy Patuna.)

In the so-called sub-peritoneo-pelvic gestation, or whenever the ovule, that was originally located in the ovary, tube, or even the uterus, is transferred, after the rupture of the cyst which inclosed it, to some part of the abdominal cavity, there is besides a pseudo-membranous cyst, representing the uterine decidua, produced by the inflammation which the presence of the ovule determines around it. But this enveloping membrane, the cyst, does not exist in primitive peritoneal pregnancies. M. Dezeimeris thus explains the latter circumstance: When a fecundated ovule gets into the abdominal cavity immediately after quitting the ovary, we can readily believe that a corpuscle so minute, soft, and fragile could only produce a very slight irritation at the point of arrestation, and that the extent of this excitation will not pass beyond the limits of contact with the little foreign body; in a word, it cannot produce an acute inflammation, or extensive adhesions, nor an exudation of plastic lymph sufficient to form an enveloping cyst. Now, if it has not primarily caused all these derangements, the neighboring organs will not be injured by its ulterior development, because they become gradually habituated thereto; and the ovule, having obtained a right of possession, lives, grows, and presents to the smooth, polished surfaces which touch it, a surface equally smooth, polished, and moistened at their expense; and not having occasion for any other protecting envelope, no cyst is formed. But when a voluminous product of conception suddenly bursts, and its contents, placed at first like it in the tube or ovary, are transported to the peritoneal cavity, the ovule becomes there a foreign body, wounding and irritating the abdominal organs which are unaccustomed to its vicinity, and determining an acute inflammation around it, which results in the exudation of plastic lymph; this, by coagulating, forms a cyst, and completely isolates the foreign body. If, under these circumstances, the displacement of the fœtus is such that it completely escapes from the amniotic cavity, and suddenly locates itself with its surrounding liquid in the midst of the intestinal mass, an inflammation occurs, and the cyst we have just described forms around it; the new cyst then completely environs the fœtus. But in some cases the displacement is not so complete—the largest part of the trunk may still remain in the amniotic cavity after the rupture, a portion only being displaced, and the latter alone first determines an inflammation around it, and then the exudation, which is transformed into a false membrane; this, by uniting with the lacerated margins, forms only a part of the fœtal cyst, the remainder being constituted by the old fœtal envelope, the walls of the Fallopian tube, for instance, in the case of a tubal pregnancy. The same relations may be established with the membranes of the ovule when the chorion and amnion are ruptured at an advanced period in a case of primitive abdominal pregnancy. For instance, in a case cited by M. Dubois, the cyst that inclosed the fœtus was formed of a membrane which was not altogether uniform in its structure and appearance: thus, for the greater part of its extent, the internal surface was of a light-brown color, owing perhaps to the imbibition of the adjacent liquids, and simulating, both to the touch and sight, the aspect of the mucous membrane of the small intestines, or, still better, the accidental membranes that occasionally line fistulous canals; while at other points, those for instance which were near the circumference of the placenta, and on the largest part of this surface, the cyst was more smooth and polished; presenting, in fact, the ordinary appearance of the amnion.

The cyst was simple, and about a fourth of a line in thickness at the part where it exhibited the brown and villous character above alluded to; but on the contrary, where the surface was smooth and polished, it evidently consisted of two membranes (the chorion and the amnion.)

In all cases, numerous and large vessels form in the walls of the cyst whose rupture it is evident must give rise to hemorrhage, which very often proves fatal to the mother.

When an extra-uterine pregnancy is somewhat prolonged, these envelopes are sometimes destroyed, being perforated with fistulous canals, communicating directly with the intestinal canal, vagina, bladder, uterus, or an external abscess. At times, the destruction of the cyst is partial, at others complete; so much so, indeed, as to leave in certain cases no vestiges of its former existence; on the other hand, the envelopes sometimes undergo osseous or cretaceous transformations, which may convert them into solid shells. As a general rule, the fœtus exhibits nothing peculiar in its development: for example, in several cases studied anatomically a long time after the term of pregnancy, the osseous system appeared to have a better development than in the ordinary child of nine months. The existence of several teeth has frequently been noticed, or else traces of the eruption of these little bones, which would seem to afford an indication that the fœtus continued to live and grow beyond the ordinary term of gestation.

The most common of the numerous alterations which it may undergo, is the putrescent dissolution of its soft parts, from macerating in a compound of amniotic liquor, blood, and pus; the separation of the various pieces of its skeleton, and their discharge through the divers routes just mentioned. At other times, it seems to have undergone a kind of mummification, a complete drying-up. Again, in other cases, all the tissues appear to be transformed into an osseous or cretaceous, substance, or into one resembling adipocire,—and here, it is doubtless unnecessary to add, it is no longer possible to discover any trace of the fœtal membranes.

B. *Tissues of the Mother.*—Some very large vascular canals are seen to develop themselves in those parts where the ovum is attached, however devoid of blood-vessels they might have been previously; and several great veins are found to ramify under the peritoneum towards the circumference of the placental attachment; and where the ovary or the tube happens to be the seat of pregnancy, it presents a soft tissue, apparently fungous in character, and impregnated with blood.

The womb does not continue so indifferent to the advancement of the extra-uterine pregnancy as might be supposed; for its volume increases in a remarkable degree, the tissues become softer, and the mucous membrane hypertrophied and more vascular, so as to form from the outset a true decidua. M. Velpeau, however, disputes this last assertion; but I have endeavored to refute his opinion in the *Bulletin de la Société Anatomique* (Sept. 1836), to which the reader is referred.

This hypertrophy of the uterine mucous membrane is of short duration.

For, as the ovum does not enter the uterus, it has no office to perform, and, therefore, like every other useless organ, becomes atrophied, loses its vascularity, and in a few months has returned to its usual condition. A gelatinous substance, a kind of thick, ropy mucus, is also frequently found in the neck of the uterus; but when the pregnancy has advanced beyond term, the womb gradually regains its natural condition. Finally, in certain cases, the calibre of the Fallopian tube has been found obliterated at some part of its length.

§ 2. Symptoms and Diagnosis of Extra-Uterine Pregnancy.

During the early months it is exceedingly difficult to recognize the existence of an extra-uterine pregnancy; for the modifications which then occur in the size, form, and consistence of the body and neck of the uterus, will certainly lead to error, and give rise to the belief of a true gestation. With regard to the menstruation and the lacteal secretion, no constant rule is observed. Sometimes the menses continue to appear; at others, they do not. In some instances this function is not re-established, even after the period when the accouchement should have taken place; and similar variations are met with in the secretion of milk. Again, menstruation has been known never to appear during an extra-uterine pregnancy which lasted more than thirty years, while the lacteal flow continued throughout the whole of that time.

There are, likewise, some abdominal pains, at a period not very distant from the date of conception, more or less analogous to the uterine pains, and at times a constant, fixed, circumscribed one in the pelvis, groin, or umbilical region. (The woman whose preparation I presented to the Anatomical Society, had on this account been treated for a partial peritonitis.) Not unfrequently there is an inability to lie upon one side. When the tumor, whilst still small, falls into the lesser pelvis, it pushes the uterus forward, the neck being directed in front and quite high behind the pubis. This displacement of the neck of the womb, together with the presence of a large tumor occupying the excavation posteriorly, and the dysuria occasioned by the pressure made upon the neck of the bladder, has been mistaken for retroversion. Several examples of this error are mentioned by Burns.

At a later period the tumor rises above the superior strait. The motions of the child are felt at the usual time, but they appear to be more superficial, and are generally felt on one side only.

The labor-pains come on at the natural term, or at the seventh month, or even sooner, generally lasting for three or four days, but occasionally much longer; and, should the pregnancy be unusually prolonged, they are apt to return at varied intervals, and again pass off.

Schmidt reports a case where the gestation lasted three years, within which period the labor-pains were renewed eight times, and on each occasion continued for several weeks.

In another gestation, of ten years' duration, the pains returned annually at the period corresponding to the term of pregnancy.

These pains are not produced by contraction of the walls of the cyst, as many have stated; because, excepting the cases of tubal and interstitial pregnancy, they never contain any muscular fibres, and hence we must search for the cause in the uterus itself; for the great development exhibited by this organ, and the mucous and albuminous matters inclosed in its cavity, the expulsion of which requires some contractions, sufficiently account for the pains experienced by the patients. But it is exceedingly difficult to explain in a satisfactory manner their frequent coincidence with the usual term of gestation.

The physical signs which require our notice are, the changes in the uterine body and neck, just indicated, the more or less irregular development of the belly, and the possibility, in some cases, of distinguishing two tumors, one being the uterus, while the other is formed by the abnormal cyst.

In the sub-peritoneo-pelvic variety, the product of conception, by occupying the pelvic excavation, displaces and compresses the organs there situated, the vagina and rectum, for instance, and pushes them to one side. The vagina and rectum are found to be obstructed by a tumor situated between them, and frequently the different parts of the fœtus may be detected by the vaginal touch.

The fœtus seems to be much nearer the surface in the abdominal pregnancy than in either of the other varieties, hence its motions are more easily perceived, and are more distressing to the mother, and the forms of the different parts more clearly distinguishable. Besides, the rounded and regularly circumscribed tumor formed by the uterus in a normal gestation is not present.

In the tubal and ovarian varieties, says Baudelocque, the fœtal movements should be less vague, and its limbs more retracted. The body of the uterus is associated with the tumor formed by the fœtal cyst, and can neither be separated nor readily distinguished from it.

I have thus brought forward the various signs by which authors endeavor to detect the different species of extra-uterine gestation, although they have, in my estimation, but little practical importance; nor do I see that auscultation itself could render us much service in determining the diagnosis.

I ought to observe that the possibility of a fresh fecundation is a feature common to all the varieties of extra-uterine pregnancy.

Perhaps it may be serviceable to note that the vacuity of the uterus might be detected by the touch. Very frequently its habitual position will be changed by the pressure of the tumor, more especially when the latter occupies the excavation, and urges it against some part of the pelvic walls.

Finally, when by the usual signs we have become assured of the existence of pregnancy, and we suspect that it is extra-uterine, the diagnosis will be reduced to a certainty if we can determine the capital point, which is, that the uterus is empty. Now we have just seen that this knowledge can be arrived at by means of palpation and the touch. Professor Stoltz was the first to use the uterine sound for the same purpose; but it will be readily understood why great prudence should be exercised in deciding to employ it. In case of a normal pregnancy, the sound would, in fact, be almost sure to produce abortion, and then the mistake would be irreparable. The use of the uterine sound is more rational and truly useful when the question to be decided is, whether there be an extra-uterine pregnancy or a fibrous tumor of the uterus.

§ 3. Progress and Termination.

It is but rarely that an extra-uterine pregnancy is prolonged beyond the fourth or fifth month; for generally the walls of the cyst give way, in consequence of their distention, before it has had time to become very large. Sometimes, however, the fœtal envelopes resist the pressure to which they are subjected, and if the fœtus itself do not perish through want of nourishment, or by some accidental disease, its development may progress until term, and it may even live for some time after the expiration of the ninth month. Such is reported by Dr. Grossi to have been the case with a lady, who, in all probability, carried an extra-uterine fœtus, whose motions were perceived clearly by himself and several consulting physicians, through a space of fourteen months. Usually, the child perishes either before or shortly after the term of pregnancy; and we shall now proceed to point out the possible consequences of its retention.

A. *Rupture of the Cyst.*—When left to itself, an extra-uterine pregnancy will generally terminate in a rupture of the cyst; but the time and consequences thereof are very variable. Were we to class these pregnancies according to the frequency of the rupture, and the early period of its occurrence, they would stand as follows: the tubo-interstitial, tubal, and abdominal.

It is very rare for the period of the rupture to extend beyond the middle term of pregnancy, except in the last variety. Dr. Lesouef very properly dwells on the tendency of tubal pregnancies to rupture at a very early stage of gestation. According to the same author, and to M. Bernutz, his master, if the rupture of the tube occurs at one of the points where it is covered by the peritoneum, the consequent effusion takes place into the peritoneal cavity; this, however, is not necessarily so, because the tube might give way at its adherent edge, and allow the ovule to slip between the two layers of the broad ligaments. In this case, the result would be a true consecutive sub-peritoneo-pelvic pregnancy.

The rupture, which is usually spontaneous, always gives rise to exceedingly grave phenomena, which may be described as the primitive and secondary consequences. Thus, the patient at once suffers from violent pains for several hours; then, after a pain which is much stronger than all the others, a perfect calm comes on. The abdomen sinks, or becomes flattened, and the former tumor disappears; a gentle and equal heat spreads over the abdominal cavity, and if the pregnancy is well advanced, the patient feels as though a voluminous body had been suddenly displaced; the skin loses its natural hue, faintings come on, the pulse is small and contracted, a cold sweat covers the whole body, and death frequently follows, because the rupture of the cyst is often the immediate cause of a hemorrhage that speedily proves fatal. Should any circumstance whatever arrest the hemorrhage, the first symptoms that follow the displacement of the product of conception, and the transference of the waters, blood, or even the fœtus itself, to parts not accustomed to such contact, are those of a very violent peritonitis. The patient generally dies, though sometimes she is able to resist the violence of the first inflammatory symptoms, in which case the course of the disease differs from that time, according to whether the debris of the pregnancy are to be inclosed in a cyst of new formation for the remainder of the patient's life, or whether they are to be eliminated in various ways. In the first case, the fœtus may undergo all the transformations described under the head of the pathological anatomy; and in the second, the symptoms vary with the manner in which the elimination is effected.

B. *Prolonged Retention of the Cyst.*—As we have already stated, the peculiarities of extra-uterine pregnancy, when the integrity of the cyst allows the development of the fœtus to proceed until term, and even somewhat beyond it, we shall not reconsider it. We would, however, add, that in some cases the disorders of the general health, produced by the development of these abnormal pregnancies, have been so great as to prove fatal, without there being any discoverable lesion to account therefor. Thus, says M. Jacquemier, the autopsy reveals neither rupture of the cyst, nor a trace of hemorrhage, peritonitis, nor process of elimination going on in the cyst: the unfortunate sufferers appearing to have succumbed under a kind of exhaustion of vital power.

The development of the cyst ceases with the life of the fœtus, the circulation in its walls becomes feebler, the vessels which maintain the connections necessary to the support of the fœtal life, gradually become atrophied, and even in great part obliterated; so that the fœtus and its envelopes are thenceforth a foreign body within the organism of the mother. Occasionally, the latter becomes accustomed to their presence; for some women carry a fœtal cyst for many years without their health appearing to be much injured thereby: we have mentioned what transformations the fœtus and its envelopes are liable to undergo in such cases. Sometimes, however, the weight of the tumor, and the pressure which it exerts upon the neighboring parts, disturb the general functions so seriously as to make the female demand earnestly to be relieved of the cause of her suffering by an operation.

Whether the tumor be the cause of acute pain to the woman or not, it is likely, after the lapse of an indeterminate period, to become the seat of an inflammation, which extends rapidly to the neighboring parts. In consequence of this inflammation, which may progress with greater or less rapidity, adhesions are contracted between the walls of the cyst and the parts adjacent; ulceration begins at the points of adhesion, perforation follows with the formation of communications between the cavity of the cyst and that of one of the neighboring organs, or with the exterior, in case the abdominal walls be invaded by the ulceration.

The fœtal debris find their way to the exterior, at times by the bladder, rectum, vagina, and even the stomach, at others by means of an abscess opening into the perineum, or through the anterior abdominal parietes. Furthermore, since these latter communications are common to all kinds of extra-uterine pregnancies, we can understand that the situation of the fœtus in the sub-peritoneo-pelvic variety, which, as before stated, is the most deeply engaged in the excavation, will render its expulsion by the vagina or rectum more frequent than in the others.

Most generally some one of the above-mentioned organs serves as an excretory canal, but in certain cases several of them are simultaneously attacked by the adhesive inflammation; of course, ulceration and perforation soon follow; and the wreck of the fœtus escapes at once by the anus, the vagina, and through a fistulous opening in the abdominal walls.

This expulsion greatly endangers the mother's life—for very often the inflammation and suppuration of the cyst, by spreading to neighboring parts, exhausts the patient, and sooner or later she succumbs. In the more fortunate cases, the sac is gradually emptied, cleansed, and contracted, the suppuration ceases, and the wound cicatrizes, or at least becomes a simple fistulous ulcer.

The long-continued suppuration, and consequent exhaustion of the patient's strength, will always render a complete expulsion of the foreign bodies highly desirable, for nothing else will put an end to the suppuration and allow the fistulas to close. Unfortunately, the hair, teeth, and pieces of bony substance adhere very strongly to the walls of the cyst, in which they seem to be imbedded, and are detached with difficulty; yet it is very necessary to be careful not to use too much force for their extraction, lest the walls of the cyst should be torn, and an opening made between it and the cavity of the peritoneum, rendering liable the occurrence of a quickly fatal peritonitis. The interference of the surgeon should be restricted to the dilatation of all the openings and fistulous passages by means of compressed sponge, to cleansing injections within the cyst, and to the withdrawal, by means of forceps, of the *completely detached* portions of bony matter which present themselves at the openings. In no case, I repeat, should any effort be made to detach the strongly adherent portions.

§ 4. Causes.

Nothing can be more obscure than the causes of extra-uterine pregnancy, although numerous facts would seem to prove that the action of terror, coinciding with the time of fecundation, may produce such an effect as to prevent the impregnated ovule from being ulteriorly transported into the uterus; but notwithstanding the high authority of those who have adopted this doctrine, it does not appear to be admissible, since the ovule does not abandon the ovary at the moment of conception, but several days after or even several days before this event.

M. Dezeimeris brings forward one case that seems to prove that a blow on the hypogastrium a short time after a fruitful coition may be the cause of this anomaly, though I should rather refer it to a particular disposition of the mother's organs. When, indeed, we consider the narrowness of the tubal canal, we can readily conceive that any deviations, even slight ones, of the Fallopian tube, any paralysis or spasm, an excess or defect of length, an engorgement, the swelling and ulceration of the mucous membrane, or hardening of its pavilion, or any retraction at the internal orifice; in one word, all the anomalies and alterations described by authors may take place there and give rise to it. I myself have had an opportunity of observing two cases (reported in the *Bulletin de la Société Anatomique*) in which the tube was obliterated between the point where the ovule was developed and the internal orifice of this canal.[1]

---

[1] The obliteration of the tube in the case referred to is so remarkable an occurrence that I endeavored to learn, by referring to various authors, whether similar cases have

Finally, if we take into consideration the singular anomaly described by M. G. Richard (see page 86), we may suppose that the fecundated ovule

---

been reported. Most of them have not observed the state of permeability or impermeability of the tube; others, on the contrary, have given their attention to this point. Thus, Smellie (vol. ii. p. 77) quotes an observation of Dr. Fern, in which an obliteration, or rather an excessive retraction of the tube was described. In the memoir of M. Breschet, on interstitial pregnancy, I found several instances where the obliteration of the uterine orifice was also noted. M. Mayer communicated a case to M. Breschet, where the fœtus was developed in that part of the tube which traversed the substance of the uterine walls; M. Mayer further remarks, that the right tube was dilated at its fringed extremity, contracted in the uterine portion, and was completely obliterated at about three lines from the uterus; the left one, in which the ovule was developed, was permeable as far as the morbid mass, but from this point to the uterus the canal ceased. He adds: It is very probable that an induration of the uterine substance formerly existed at the insertion of the left tube, which caused the occlusion of its orifice, *and furnished an obstacle to the passage of the ovule.*

M. Schmidt reports that in an example of interstitial pregnancy, of six weeks, the internal orifice of the right tube was completely closed. (The ovule was developed on the right side of the womb.)

M. Menière (*Archives*, June, 1826) furnishes a case of interstitial pregnancy located in the left cornua, and he says the left tube was impermeable at its internal part.

M. Gaide, in a similar instance (*Journal Hebdomadaire*, t. i.), ascertained that the right tube had no uterine orifice.

Another case is reported in the *Archives* of a mortal hemorrhage produced by tubal pregnancy. The author adds: "The left tube (the ruptured one) formed a consistent membranous sac, and its free extremity embraced the whole ovary; below the dilatation and in the uterine portion, the canal was completely obliterated in such a manner that it was wholly impossible to reach the uterus through it."

I might cite a greater number of examples, but I think these will suffice to prove that an obliteration of the tube is sometimes met with in extra-uterine pregnancies; for whenever we find the canal effaced between the ovule and uterus in a tubal gestation, it seems natural to suppose that, if the product of conception has been arrested in the course it has to travel in order to reach the uterus, some mechanical obstacle has opposed its passage, and that the effacement is the cause of such hinderance in the progress of the ovule; consequently, the cause of this variety of gestation, at least, seems to me clearly indicated. But how long has the effacement existed? Was it prior or subsequent to the conception? In reply, it may be said that, according to the ideas generally admitted by physiologists, an obliteration of the tubes is an infallible ground of sterility, and when met with in a pregnant woman it would be absurd to suppose that such an obstacle was in existence before impregnation. In this case, the seminal fluid could not reach the ovule, for its only way is closed up and the fecundation cannot occur.

Let us examine, however, whether this is the only admissible opinion: it is well known that the obliteration of a canal, lined internally by a mucous membrane, can only result either from the coagulation of a secreted liquid, the chronic engorgement of its walls, or from their adherence to each other; and in either of these cases it is necessary to suppose the existence of a previous inflammation; but in neither of the instances mentioned have I noticed that the females exhibited any peculiar phenomena during the early periods, those immediately following the fruitful coition. Again, even supposing the inflammation is latent, and too feeble to produce any sensible effects, we must admit that its progress has then been very slow, and that it could not determine an obliteration of the walls (whatever be the mode of its action) until after the lapse of a considerable time; now the ovule, at the earliest, arrives in the womb about the tenth day, and therefore the inflammation and the subsequent effacement must take place within that short period; but, even admitting this hypothesis to be true, some cause for this phlegmasia in the tube must be assigned, and the partisans might, in its progress along the tube towards the uterus, escape through one of those accidental openings, and so fall into the abdominal cavity.

of that opinion have not hesitated to assert that it is either produced by the irritation, and the sanguineous congestion, experienced by all the genital apparatus at this period, or by a spasmodic condition of the tubal walls, or, further, by the presence of the ovule itself.

I shall reply to this perfectly hypothetical explanation, by simply presenting a single fact. It is this. In some of the cases related in the memoir of M. Breschet, and in several others from different writers, not only was the tube that served as the seat of gestation obliterated, but also the one on the opposite side; and consequently, in these instances at least, we cannot admit that a spasm of the walls, or any irritation from the ovule's passage, was the cause of effacement, and therefore we have to believe that it existed previously.

From all which it follows, as a natural consequence, that, contrary to the opinion generally received, it is not necessary for the sperm to pass successively through the uterus and the Fallopian tube, so as to approach and fecundate the ovule; and, further, this conclusion permits the adoption of certain facts which have been rejected as improbable; for we can explain by it how, in some females, there may happen to be a complete occlusion of the os tincæ at the period of labor; how, in others, the fecundation has taken place without a proper introduction of the membrum virile, the physical proofs of virginity even remaining at the time of labor.

But how, then, can conception be explained? Without adopting the theory of the *aura seminalis*, Chaussier, Mad. Boivin, and M. Dugès thought it was only necessary for the spermatic fluid to be deposited at the entrance of the vagina, so that, by absorption, it might be taken into the circulation, and then be brought back through the blood-vessels to the ovary, where the fecundation occurred. This hypothesis would, indeed, explain all the anomalies; but it is not founded on a single anatomical fact, nor yet upon any direct experiment, and further, it is at variance with the researches of modern ovologists; so of course I shall not dwell further upon it.

Perhaps comparative anatomy might throw some light on the question before us: thus, in certain mammalia, such as the hog, cow, &c., the Fallopian tube is not the only canal that affords a passage to the sperm; for M. Gartner, of Copenhagen, has announced the existence of a particular duct in these animals, which extends from the external parts through the substance of the broad ligaments. In 1826 he came to Paris, and, conjointly with M. de Blainville, made some new researches on this point, the results of which the French naturalist has communicated to the public in the *Bulletin de la Société Philomatique*, t. 9, p. 109, 1826. The latter says, that if the vagina a young sow be carefully examined, a particular canal will be discovered, having external orifices on each side of the meatus urinarius, and running through the muscular fibres of the vagina; it becomes contracted near the neck of the uterus, but do not the less continue in the uterine tissue. This canal at first follows the body of the womb, then abandons it, and runs in the substance of the broad ligament parallel the corresponding cornua and close to the origin of the Fallopian tube, where it lost by seeming to spread out, or to subdivide into two or three filaments, which can scarcely be distinguished from the vessels, and more especially from the proper tissue of the broad ligament.

M. de Blainville says he has searched in vain for similar canals in women, but he has not met with anything of the kind. Analogy, however, renders their existence probable in the human species; and this probability becomes still stronger from the account of a case communicated by M. Baudelocque to the Académie de Médecine (*Arch. de Méd.* 1826), as a unique anomaly in the science; although it is a very singular fact that Dulaurens, according to the report of Mauriceau (*Traité des Maladies des Femmes Grosses*, p. 12, t. 1), had several times observed that the tube, after arriving at the angle of the uterus, separated into two distinct canals, the larger and shorter of which was inserted in the fundus uteri, while the other, being narrower and longer, terminated at the neck, near its internal orifice.

§ 5. Treatment.

It is evident that no operation could be attempted in the earlier months of pregnancy, even if we should be fortunate enough to ascertain with certainty that the ovule was not developed in the uterus.

It is my opinion, however, that frequent copious bleedings should be resorted to in such cases, for the double purpose of causing the death of the fœtus, and of preventing (possibly) a congestion, or rather too great a determination of blood towards the point at which the ovum is being developed.

Indeed, it seems clear to me, that not only does the constantly increasing weakness of the walls of the cyst, but also the local congestions so common during pregnancy, contribute to render rupture of the cyst more frequent.

Venesection, practised within the limits authorized by the general health of the patient, will be the more indicated here, as its unfavorable influence on the child's life is not to be dreaded, since its death is the most fortunate event that could occur. Might this latter result be obtained by passing electric shocks through the cyst? Still, if no obstacle can be opposed to the constant development of the fœtus, every operation must be proscribed at this period for extracting the fœtus from its mother's body, because an operation would be as dangerous as the anticipated accident. Even when the

---

De Graaf (*Opera Omnia*, p. 212) thought he had found canals in women, similar to those described by M. Gartner as existing in certain mammalia.

Lastly, Mad. Boivin declares she has met with cases analogous to the bifurcated canal of M. Baudelocque. Hence, in these examples at least, there is good ground for supposing that a conception may occur, even when the internal orifice of the tube is wholly obliterated.

Now if, as Mauriceau and Dulaurens say (whose researches the modern authors seem to have entirely overlooked), such anomalies were found at a period when dissections were much more rare than at the present time, we may conclude that, if the writers of our own day have not realized that disposition, it is because their efforts are not directed to the same end.

I shall close these remarks by bringing forward a case, reported by M. Reynauld, in the second volume of the *Journal Hebdomadaire*, An. 1829, as follows: A young woman, aged 21 years, died at La Charité in consequence of a vertebral caries. At the autopsy, the uterus was found as large as the pregnant organ at six weeks, and its enlarged cavity was occupied by a false membrane having just the same shape, but in which no opening was discovered. The adhesions to the walls were easily broken up, and three or four ounces of a yellowish liquid were found inclosed within. No trace of the internal orifice of the tubes existed, and they were equally obliterated at the free extremity. The long diameter of the ovaries exceeded an inch in length, and their surfaces exhibited evident traces of numerous cicatrices. Both of them contained in their interior a rounded body of a brownish-red color (a true corpus luteum), and small fibrous pouches were detected in several places, with wrinkled and retracted walls. Numerous little ovoidal bodies, about the size of hemp-seed, resembling the ovules, existed along the course of the tubes and in the thickness of the broad ligament.

It was very remarkable in this case that, notwithstanding a complete obliteration of the tubes, the organs of generation were found in a condition similar to what is observed at the commencement of the generative action. However, I shall deduct no direct conclusion therefrom; but I would ask your attention to the confirmation it affords of the ideas promulgated in this report (Report of M. Cazeaux, extracted from the *Bulletin de la Société Anatomique*.)

spontaneous rupture of the cyst, during the early stages, occasions a just fear of mortal hemorrhage, we can only employ those general means which are the best calculated to prevent profuse discharges, such as rest, refrigerants, etc. Again, supposing that a well-marked case of extra-uterine pregnancy has advanced almost to term, or that the labor has actually commenced, we may still justly dread the laceration of the cyst as a consequence of the expulsive efforts; and the question then arises whether gastrotomy, which has been successfully practised in similar cases, ought to be resorted to. If the child's safety be alone considered, this question is easily resolved. But is not the life of the mother almost necessarily compromised by such an operation?

How shall we persuade the patient, when the proper period for operation has arrived, if she herself does not suspect the danger she encounters by refusing? Or how, indeed, can we ourselves decide, when the possible consequences are foreseen, the whole difficulties of a delivery appreciated, and the necessity staring us in the face of leaving open in the abdomen a vast cyst, the inflammation and suppuration of which are so difficult to dry up and are of themselves sufficient to endanger the sufferer's life?

In such cases, who can doubt, says M. Dezeimeris, that if there was any measure at all that could suspend the commencing labor, the ties of humanity alone would render its employment a duty? And I fully embrace the same opinion.

Now among the means calculated to restrain the ordinary uterine contractions, I know of nothing more serviceable than opium, when exhibited in large doses per anum, and I certainly should not hesitate to employ it under these circumstances; but if the labor continues, notwithstanding its use, gastrotomy may then be authorized.

The cyst is generally opened through the abdominal parietes, the plac of selection being the same as in the common Cæsarean operation, thoug in case the head be felt through the vagina during the expulsive effor less danger would certainly accompany an incision through the walls of latter. The child may be extracted by turning, or by the forceps, if nec sary. In two cases, one of which is attributed to Lauverjat, both mot and child were saved by an operation of the kind. In three other cas collected by Burns, the child was extracted alive, but the mother perish

Finally, it is evident that if a prolonged labor has produced a rupture the cyst, it is very doubtful whether gastrotomy could be successful.

The first efforts should be directed towards moderating the hemorrhag and when the first dangers have been removed, every means of preventi and opposing consecutive inflammation should be energetically employed

But the primitive phenomena once calmed, whether there be a rupture not, our art may evidently interpose to prevent the consecutive accide that have been enumerated, and which compromise to so great an exte the health and even the life of the patient. When the inflammatory sym toms have ceased, it is proper to wait; and especially after the cyst ruptured, hasty action becomes unnecessary.

In fact, a considerable period is requisite in such cases for the develo ment of a new cyst around the displaced parts, and a certain length of ti ssary for the adhesions to form between them and the adjacent parts, would be exceedingly rash to interfere with this salutary action by opportune operation on our part. In old abnormal pregnancies, the rces of art vary with the particular case. Sometimes, indeed, an elimi-y effort has already commenced by an inflammation of the integuments d just in front of the tumor, whereby an abscess is formed; and the question then is, whether to open it, or by suitable incisions to enlarge spontaneous solutions of continuity; in either case we encounter a vast ess, which must be emptied and cleansed by the usual methods.

hen some portions of the fœtus get into the bladder, and we are assured hat fact by the use of the catheter, the operation for stone may be prac-d either through the vagina or by the hypogastrium. Again, a woman y present herself with an extra-uterine fœtus of one or several years' ding. Can the resources of art afford her any relief? We reply, that he gestation is a source of severe suffering, and it renders her incapable discharging her duties; and if, besides, the tumor may be reached through vagina without difficulty, the vaginal incision should doubtless be per-med. But if she is otherwise in good health, would it be prudent to terfere for the mere purpose of anticipating the accidents to which she ll probably be afterwards exposed? Or is there any ground for hoping extract the fœtus *en masse*, by a prudent and methodical operation? This last question is far more difficult to solve. In a case of this kind, where the head of the fœtus, from being wedged at the superior strait, could readily be felt through the posterior superior part of the vaginal parietes, I knew Professor P. Dubois (notwithstanding sharp opposition from several of his brethren in consultation) to resolve upon incising freely the vaginal wall, as well as the cystic envelopes, intending to apply the forceps on the head, and thus extract the fœtus bodily; but the walls of the cyst and vagina having been cut through, an intimate adhesion was discovered between the former and the fœtal head, which caused the operation to be abandoned. It was not without benefit, however, for in the course of a few days it was followed by the discharge of a putrid mass, comprising all the soft parts of the fœtus; the detached bones of the skeleton were gradually extracted by the aid of long pincers, and frequently repeated injections; the cystic walls contracted slowly; and when, at length, nothing remained, and the parietes were cleansed, the opening gradually closed up, and by the end of two months the patient was completely cured. At the time of operating she had been pregnant twenty-two months.

This plan, I think, ought to be followed up in similar cases, more especially if the female's health is visibly affected.

Incision by the rectum has been practised in some few instances where the vulva was obliterated.

Finally, gastrotomy alone would be practicable when the fœtus, from its high situation in the abdomen, is inaccessible by the vagina or rectum; but this operation must be regarded as the last resource, and only to be resorted to where the patient's life is seriously endangered.

PART V.

OF DYSTOCIA, OR PRETERNATURAL AND PAINFUL LABORS.

ALTHOUGH labor is a natural function, and the resources of the organism are usually sufficient for its accomplishment, yet there are a number of circumstances which may interfere with the work of nature, and render the process difficult, dangerous, or even wholly impossible. It is to the exposition of those difficulties and dangers, and more particularly to the indication of the appropriate measures for preventing or for remedying them, that the fifth part of this work is devoted. In it will be pointed out the difficulties and accidents which may complicate labor and demand the intervention of art.

The causes that render a labor either difficult, impossible, or dangerous, and which therefore require the more or less active interposition of the accoucheur, are numerous, varied, and far from always having the same mode of action; some, indeed, operate only by enfeebling or reducing the forces necessary for the expulsion of the child, while others constitute an obstacle to its delivery by occasioning a disproportion between the dimensions of the pelvic canal and those of the body that must traverse it, thus rendering the most powerful contractions of the womb entirely nugatory. On the other hand, when all the conditions are apparently most favorable to a natural labor, we may find a number of accidents suddenly manifesting themselves, of a character dangerous to the lives of both mother and child.

Consequently, as regards the causes that may thus interfere with the regular process of nature, we may distinguish three different groups of difficult labors, namely: 1. Those rendered difficult, impossible, or dangerous, by a deficient or excessive action of the expulsive forces. 2. Those rendered difficult, impossible, or dangerous, by obstacles to the expulsion of the fœtus. 3. Those complicated by accidents liable to endanger the life or health of the mother and child.

The term *accident* is more especially applied to any morbid phenomenon occurring during labor, liable to be rapidly fatal to either mother or child. These accidents, in the above restricted sense, are, fortunately, but few. They are on the part of the mother: 1. Eclampsia. 2. Rupture of the uterus. 3. Hemorrhage in its various forms. On the part of the fœtus, the only accident to be apprehended is prolapsus of the cord or its compression.

CHAPTER I.

OF LABORS RENDERED DIFFICULT, IMPOSSIBLE, OR DANGEROUS, BY DEFICIENCY OR EXCESS OF ACTION IN THE EXPULSIVE FORCES.

IN practice, we meet with numerous cases in which the position is favorable, the organs of the mother and child well formed, and in which none of those grave complications, hereafter spoken of, that have given rise to the title *preternatural labor*, are met with; but in which, notwithstanding, the different stages of the labor are not accomplished with the customary ease or regularity. Now, everything seems so admirably arranged in the works of nature, that the least deviation is sufficient to interfere with their accomplishment; and whether this deviation be dependent on an unusual slowness or an excessive rapidity in the course of the phenomena of parturition, it may prove detrimental, in either case, to the mother or her child, and require the intervention of art just as imperiously as would a hemorrhage or a contraction of the pelvis. We therefore believe it will prove serviceable to treat, with a little more detail than has hitherto been done, of the causes and proper measures for preventing the disastrous consequences of extreme slowness or a too rapid progress of the labor.

ARTICLE I.

OF EXTREME SLOWNESS OF THE LABOR.

Whilst stating (page 297) the usual duration of labor, we were careful to remark that it was often prolonged beyond the fixed period, and that a duration of eighteen or twenty hours, in primiparæ especially, could not be regarded as an alarming circumstance; but that, in all cases, where more than twenty-four hours have elapsed from the time of its commencement, serious accidents might result therefrom, either to the mother or the child, which should always be prevented by removing immediately the cause of this excessive slowness.

In natural labor, the phenomena occur with such a marked degree of regularity that, as regards the duration, the period of dilatation of the cervix is to that of the expulsion as two or three to one; though it is proper to state that the delay may be manifested during either the first or the second stage, and then, of course, this proportion no longer exists. This distinction, which might serve to establish a classification of the causes that retard the labor, if, indeed, they do not make their influences felt in all stages, merits a particular attention with regard to the prognosis; for, although the first stage may be prolonged without danger, the second, on the contrary, cannot pass beyond certain limits without greatly endangering the health of the patient, and oftentimes the life of her child. It is found that the latter is lost at least one time in four, when the head remains in the excavation longer than seven or eight hours after the complete dilatation of the os uteri, and the rupture of the bag of waters, whilst it nearly always survives when the first period is prolonged even to forty, fifty, or sixty hours and more.[1] Besides, in the latter case, there are scarcely any symptoms worth mentioning presented by the mother, for the great fatigue caused particularly by the loss of sleep, and in nervous women, a considerable irritation, depression of spirits, and alarm, are about the only inconveniences that result from it; since the contraction, although feeble, returns at regular intervals, and the labor makes some progress, notwithstanding it is slow. But when the period of expulsion is extended beyond ten or twelve hours, the pain, as a general rule, is found to become irregular, both in its returns and intensity; and, although it be sometimes more severe and frequent, it is in reality less efficacious, to such an extent, indeed, that the fœtus really seems to be retrograding instead of advancing; in a word, there are uterine pains, but no expulsive contraction.

The local disorder is accompanied, or at least is soon followed, by a violent trembling; the patient has an inclination to vomit, and even throws up bilious matters; she is uneasy, excited, and changes her position every moment; the skin is hot and dry; the pulse runs up to a hundred or a hundred and fifty per minute; the tongue is dry, and both it and the teeth are covered with a dark coating. The vagina and cervix are hot, and sensitive to the touch, and a yellowish liquid escapes from them, which occasionally has a fetid odor; the pressure of the child's head on the neck of the bladder prevents the emission of urine; and the parts that line the superior strait and the pelvic excavation, being compressed for a long time by the head, may become inflamed or even gangrenous; which complications may subsequently prove a source of the most serious accidents.

If the woman still remains undelivered, these symptoms augment in intensity in a frightful manner; the vomitings become more frequent, and the abdomen more distended; the excitability of the patient knows no bounds; the pulse is more and more feeble and frequent, and she falls into a half stupid or a semi-delirious condition, which is soon terminated by death. It is scarcely necessary to remark that, in the latter case, the life of the child is also most seriously compromised.

We have felt bound to point out these differences in the danger of the symptoms, in order to prove the necessity of the distinction we have made; and we may now proceed to study the divers causes which, at times, retard the course of labor, and also to indicate the means calculated to remedy them, without the necessity of repeating in each, that the dangers to which they expose the mother and child are much more grave in the second than the first stage of the labor; and that, although in the latter we may trust longer to the resources of the organism, in the former, the intervention of art is demanded at an earlier period.

The causes that may retard the delivery depend either on the patient's general condition, or on a special modification of the genital organs; and, in both cases, their influence may be exerted at the commencement, or only at a subsequent period of the labor; consequently, we have to consider the three following conditions: 1, where the pains or contractions are slow or feeble in the commencement; 2, where, after having set in with considerable energy, they afterwards relax, diminish, or even cease altogether; and 3, where they exhibit great irregularity in their duration, intensity, and returns; an irregularity that almost wholly destroys their expulsive action. The English writers have applied the term *tedious labor* to all these varieties, and this appellation merits our adoption, for it is perfectly adapted to the cases we are about to describe.

---

[1] The following summary, which I take from Churchill, is calculated to confirm the above: in one hundred and thirty-three cases, where the first stage was prolonged from twenty-four to sixty hours, only eight children were lost; in eight that lasted from sixty to a hundred hours, but one died; and in three cases ranging from a hundred to a hundred and seventy-seven hours, not a single death occurred.—*Churchill*, 192.

§ 1. OF SLOWNESS OR FEEBLENESS OF THE CONTRACTIONS.

A *slowness or feebleness of the contractions* may occur at the very commencement of the labor, and persist throughout its whole duration; the pains are quite feeble, the dilatation of the os uteri is effected very slowly, and at a rather later period they seem unable to effect the expulsion of the head. This slowness of labor may be dependent either on the woman's general condition, or on a local disposition of the womb. In the former case, it occurs in women endowed with a delicate or debilitated constitution, or in those accidentally enfeebled by chronic diseases.

It should, however, be borne in mind that, as was stated, page 150, general debility of the muscular system has but little influence upon the contractile power of the uterus, the latter being often very strong, as in consumptive patients for example. The labor sometimes progresses even more rapidly than usual in such individuals, for when the uterine fibre preserves its contractile powers, the slight resistance at the floor of the pelvis seems to expedite the delivery.

Generally speaking, there is nothing to be done but to encourage the woman to have patience, and to make use of some slight stimulus, such as broth, claret, or a few spoonfuls of sherry-wine; in a word, to sustain her strength as much as possible, resorting to the ergot, or preferably to the forceps, as soon as the cervix is sufficiently dilated, if the uterine contraction is too feeble to effect the engagement and subsequent expulsion of the head.

But where the slowness of the labor is to be wholly attributed to a local condition of the womb, the determining causes ought to be carefully sought after, as they are variable, and require the employment of different means; and hence we learn the importance of a correct diagnosis.

A. An excessive distention of the uterine walls, whether dependent on dropsy of the amnios or on the presence of several children in the womb, should be placed in the first rank of these causes. In fact, this overdistention renders the uterine walls much thinner than usual, benumbs them in some measure, and diminishes their force of contraction. Independently of a considerable enlargement of the belly, and the unusual elevation of the head towards the end of gestation or beginning of labor, which is worthy of attention, there is something then altogether peculiar in the character of the pains. The contractions, though feeble and only returning at distant and irregular intervals, reduce the patient to a state of anxiety and continual suffering; and, if we may judge from her expression, seems to implicate the fundus alone, without extending lower down, for the amniotic pouch, if still unruptured, scarcely bulges out during their continuance. Under such circumstances, we should carefully avoid resorting to stimulants, which would have no other effect than to augment her sufferings, without rendering the contractions any more energetic. The rupture of the membranes is here the only remedy, because, by facilitating the discharge of the waters, we relieve the excessive distention of the organ, as well as the continual distress thereby occasioned, and then the genuine pains become more frequent and more effectual.

B. The slowness and feebleness of the contractions may likewise depend on a sanguineous engorgement, or plethora, of the uterine tissue. This condition, when it exists, can be recognized by the following signs: the pains are at first quite energetic, but soon diminish, both in frequency and intensity; the cervix uteri is soft, supple, and non-resistant, but the presenting part does not engage during the pain, which latter is equally diffused over the whole abdomen; the phenomena of general plethora nearly always manifest themselves at the same time; thus, the respiration is laborious, the pulse hard and full, and the pains very irregular, both in force and frequency. Bleeding in the arm, proportioned to the general condition of the patient, is then the best remedy.

C. Or it may be owing to a debility, or an imperfect organization of the uterus itself, though the patient may otherwise be perfectly healthy, that is, the muscular apparatus of the womb may be deficient in contractile force, while the other muscles of the organism are endowed with their usual energy. The dilatation of the os uteri is effected slowly, for notwithstanding the cervix no longer offers any resistance, the organ appears incapable of determining the expulsion of the foreign body it encloses. In such cases, the ergoted rye is the only article capable of stimulating the enfeebled contractions. The most certain procedure would be to apply the forceps, provided the dilatation be sufficient to permit it.

Dr. Franck, of Wolfenbutten, has recently recommended the employment of electro-magnetism in cases marked by weakness or absence of the contractions, giving four observations, in which, he states, it was used with advantage. The perusal of these cases fails to convince me of its utility. Besides, the difficulty of obtaining a proper apparatus when wanted, will render its employment a thing of rare occurrence.[1]

D. According to Baudelocque, the death of the child would have the unfavorable effect of diminishing and enfeebling the utering contractions; but M. P. Dubois remarks, and very justly, in our opinion, that, if the woman is otherwise healthy, this event has no influence over the progress of her labor; and that, if it sometimes happens that the delivery is more painfully accomplished where the infant has been dead for some time, it is only because the disease of the mother has been the occasion of its death, and that her forces are weakened by the antecedent malady.

---

[1] The author's apparatus is composed of a concave metallic plate, moistened with salt water, applied upon the lumbar region, and connected with the positive pole of a rotating electro-magnetic machine. The negative conductor is attached to a hollow cylinder filled with salt water, and passed into the vagina to the neck of the womb. The electro-magnetic current is applied for five or six minutes between the contractions, and suspended during their continuance.

E. Finally, a premature rupture of the membranes may have the same effect, in relaxing and weakening the pains, as their more retarded rupture; and the following phenomena may then take place: if the head happens to be very large, and is low down when this occurs, it becomes applied directly to the orifice, and retains a great part of the waters behind it, and if the os uteri is sufficiently dilated to permit the head to engage freely, no water escapes, even during the contraction; but if the dilatation is still imperfect, the waters leak away drop by drop, it is said, at the commencement and termination of each pain, which latter is wholly employed in thus gradually expelling the amniotic liquid, without contributing in any wise to the enlargement of the cervix. The same phenomenon is observed when the membranes yield at a higher point of the pouch, one not corresponding at all to the neck of the uterus, for in such cases but little water escapes at the moment of the rupture, and each pain is likewise accompanied or followed by a greater discharge without accelerating the dilatation in the least. However, this circumstance, according to M. P. Dubois, does not merit all the importance usually ascribed to it, since, properly speaking, the expulsive process has not commenced, and the fœtus, protected by the surrounding liquid, cannot suffer in any wise from the slowness of the labor, and therefore, in most cases of this kind, there is nothing to be done. If, however, the labor lingers too long, we might follow the plan generally advised, and introduce two fingers into the cervix uteri, and push up the child's head, for the purpose of promoting a more ready escape of the waters, or, indeed, of lacerating the inferior segment of the membranes, if the original rupture had occurred at a much higher point. Nevertheless, this manœuvre is only to be resorted to when the dilatation is already well advanced, for it is evident that, if all the waters should escape a long time before the enlargement of the neck, the infant might suffer from the prolonged and direct compression of its body.

§ 2. Relaxation or Suspension of the Pains.

It is not at all unusual to find a labor which has heretofore been progressing favorably to become at once arrested, and the pains, which up to that time were strong and frequent, to relax or even disappear altogether. Of course, the indications which these phenomena present will necessarily vary with the causes that have given rise to them, and therefore the physician ought to search them out with the greatest possible care. Among those which may thus diminish or suspend the pains, the following are usually enumerated, namely:

A. Any vivid moral impressions operating during the labor, any unexpected news or sharp discussions, the announcement of a child of an unwished-for sex, and the arrival or presence of persons disagreeable to the lying-in woman, may determine a cessation of the pains; and in these cases the removal of the cause is the only remedy. But, unfortunately, it is not always an easy matter to ascertain what that cause may be, and it is left to the prudence and sagacity of the medical attendant to penetrate the mystery and relieve the trouble.

B. A pain caused by the coincidence of some malady, either existing antecedent to, or appearing during the labor, such as distressing and repeated vomitings, sharp pains in the muscles of the back and abdomen, gripings in the intestines, &c., &c. In all such instances, the woman, experiencing an intense pain, which is further heightened by the uterine contraction, endeavors to suspend the latter as much as possible, and hence the accoucheur should try to remove the cause which thus interferes with the labor. For instance, where the emesis obstinately persists, he ought, if the patient bears opiates well, to administer a few drops of laudanum, and if not, some aromatic drinks or antispasmodics, accompanied by narcotic lotions over the epigastrium. In case of acute muscular pains, embrocations with an opiated liniment might be practised over the affected part, or a change of position is sometimes all that is requisite to calm them. If, however, as often happens, this pain, which is wholly foreign to the uterine contraction, cannot be relieved, then the powers of nature must be assisted by an artificial termination of the labor.

Those violent cramps, which are occasionally produced by the pressure of the child's head on the sacral nerves, should certainly be classed among the circumstances that may relax or even suspend the uterine contraction altogether; as occurred in three cases of the kind observed by Prof. Meigs, of Philadelphia, where the pain was so violent that it caused the patient the most inexpressible anguish. The women describe this pain as similar to what would be produced by the pinching or twisting of a large nervous trunk; they incessantly demand a prompt deliverance, and the physician is often obliged to yield to their entreaties; besides, his intervention may be further necessitated by the more or less perfect suspension of the contractions of the womb; for the organ seems paralyzed by the violence of these nervous pains, and we are often constrained to apply the forceps for the double purpose of relieving the patient from the frightful sufferings that torment her, and of supplying the want of power in the uterine efforts.

The use of chloroform might, in all these cases, have a happy effect by paralyzing the animal sensibility and thus allowing the uterus to resume its functions. The English accoucheurs have often used it successfully in this way.

C. We have already alluded (page 393) to the unfavorable influence that a distended bladder might have over the progress of parturition; and therefore, if the suspension of the pains could be justly attributed to this circumstance, the catheter should evidently be resorted to at once; but if this operation is rendered impossible by the engagement of the head in the excavation, recourse should be had to the application of the forceps; for the administration of ergot here would appear to be very imprudent, to say the least.

D. If caused by general plethora, which is characterized and is easily recognizable by redness of the face, headache, throbbings in the head, vertigo, dimness of vision, tinnitus aurium, agitation, unusual force and fulness of the pulse, and by weariness of the limbs, it must be relieved by general venesection.

E. Debility of the uterus itself is also mentioned as a cause, since there are some women in whom the contractile force of this organ is so easily exhausted that the contractions, after having proved quite sufficient for the earlier steps of the labor, diminish, or disappear all at once, without any other appreciable cause than this feebleness of the organ. In such cases, the patient should be advised to rise up and walk about the chamber for some time, and it is also necessary to rub her abdomen, to titillate the cervix uteri, and to make pressure on the perineum; and then, if all these means fail, to administer the ergot or uterine douches, and finally apply the forceps if necessary.

§ 3. Irregularity of the Pains.

The contractions may be irregular in their progress, or they may be partial in their operation: that is, only one portion of the uterine walls contracts, the rest of the organ remaining in a state of inaction; which irregularity is sufficiently explained by the muscular structure of the womb. In the first variety, the pains are recognized by the following signs: there is not a complete and perfect interval between them, they are continuous, and only interrupted by the paroxysms, during which the intensity of suffering is horrible. In the second variety, the pain returns, it is true, at intervals, but sometimes it is only the fundus, again one of the angles, and at others, some part of the body, which contracts spasmodically, whilst the remainder scarcely does so at all. The pains are, however, no less acute than if the whole organ were involved; often, indeed, they are more so, though even then they are easily recognized by the fact of occurring almost without effect, or at least without having a decided influence upon the progress of the labor. For during the pain, and even at the very moment when the woman suffers the most, we may ascertain, by applying the hand on the hypogastrium, in the case of partial contraction, that the uterine ovoid does not present its normal regularity, and that it exhibits instead various bosses and inequalities; besides, we can readily assure ourselves, in all cases, that no impulsion is given to the fœtus, and that the presenting part does not advance; as, also, that where the membranes are still unruptured they do not bulge out, nor indeed scarcely become tense during the pain. At the height of the latter, just at the moment of the paroxysm, the presenting part seems, at times, to advance a little; but this progression does not correspond, on the one hand, with the violence of the pains, and, on the other, it is not kept up, though the pains continue. The patient is then suffering from an extreme agitation, she weeps and becomes despondent, and very often her pulse is frequent, developed, and febrile; the face red and flushed; the skin hot; the mind confused, and the limbs convulsively contracted. These irregular contractions, which have been designated under the title of *uterine tetanus*, sometimes disappear of their own accord, though they may be prolonged for an indefinite length of time. It is then highly important to remedy them as soon as possible, which is best done by a general bleeding where the woman is plethoric, the pulse full and well developed, and the face red and flushed; but as this is not practicable in nervous and very irritable women, we should then resort to tepid baths, emollient injections, and opiated lotions over the abdomen, and more especially to laudanum, given once or twice as an injection, in the dose of twenty to forty drops, diffused in three or four ounces of some mild vehicle.

Under the influence of these measures, the last particularly, the pains almost entirely disappear in the course of half an hour or an hour; during which period the patient generally slumbers, and then the good pains, that is the natural and regular ones, come on, and the labor terminates happily.

The action of opiates is occasionally much more prompt, being felt in the course of ten minutes or a quarter of an hour after their administration. I witnessed this fact in a young primiparous lady, whose labor commenced at ten o'clock in the morning, and the pains progressed slowly but regularly until four the next morning, when they assumed the peculiar character under consideration; and from that moment, notwithstanding the almost continuous suffering and permanent contraction of the womb, the head did not descend. At six, I administered opiates; and in the course of ten minutes, the excessive agitation was calmed, the pains disappeared entirely, then returned again a few minutes after, at first slow and feeble, but soon regular and energetic enough to effect the delivery in a short time. When the cervix participates in this state of spasm, the employment of the ointment and extract of belladonna, as we shall have occasion hereafter to point out, will be found decidedly useful; though we ought to mention that the employment of belladonna has been objected to on the ground that it suspends the pains, and paralyzes the exercise of the contractility of tissue after the labor is over; but this is an error, for its action is always limited to the neck, and the latter, at most, may be paralyzed for some time.

In the case before us, M. Velpeau says he has used the following potion with advantage: ℞.—Lettuce, or wild poppy water, f℥iv; orange-flower, or mint water, f℥j; syrup of white poppies, f℥j; extract of opium, gr. j.

It appears to me that inhalation of anæsthetic agents might be used with advantage in all these cases of partial or irregular contractions. They would seem adapted to calm the over-excitement of the uterus with which the pains are generally associated. In several cases they acted like opium, by suspending the contractions for the moment, and then enabling them to resume their normal regularity and efficiency.

§ 4. EFFECT OF CONTRACTION OF THE ABDOMINAL MUSCLES.

The second stage of labor is sometimes exceedingly slow in very fat women; in whom the contractions do not cease altogether, but appear to be ineffectual, and do not force the child's head to advance; this impotence of the uterine efforts has appeared to me to be much less dependent on resistances from the lower part of the pelvic canal, than on a default of action in the abdominal muscles; because the thick layer of fat, which lines the anterior walls of the belly, must paralyze, to a certain extent, the synergic action of those muscles, and thus deprive the uterus of the aid which they habitually render. The abdominal compression, which is so much extolled as a remedy, would then appear peculiarly applicable; for a circular bandage, applied around the body, would effectually replace the *point d'appui*, which the contracted muscles usually furnish to the womb; besides, as Velpeau observes, this is too innocent a remedy not to be employed before having recourse to ergot, or to an artificial termination of the labor.

[Admitting that contraction of the uterus is the principal efficient cause of delivery, a fact proved by vivisections practised upon animals and pathological cases occurring in women, it is nevertheless true that the contraction of the abdominal muscles and the exertions of the female assist powerfully in the expulsion of the fœtus. Some cases would even seem to show that paralysis of the abdominal muscles, making a strong voluntary effort impossible, has sometimes delayed delivery very considerably.

A paraplegic woman attended by M. Depaul had to be delivered by the forceps on account of the slow progress of the labor. In her case, the uterus contracted regularly, and there was no obstacle to the expulsion of the fœtus. M. Depaul was sure that the extreme slowness was due to the paraplegia. I have myself met with a similar case in a multipara whose labors before becoming paraplegic had always been easy. Notwithstanding the paralysis, she became pregnant; but this time, although the uterine contractions were rapid and powerful, it was necessary to deliver her by the forceps.

The unfortunate effect of an impossibility of making sustained efforts from other causes is shown by a case of a different character witnessed by M. Depaul. A young lady whose thigh had been amputated became pregnant, and during labor was, consequently, able to take the usual fixed support with but a single foot. The consequence was, that the necessarily badly directed exertions which she made seemed to weaken the uterine contractions. The pelvis was well formed, and there was nothing to obstruct the passage of the fœtus, yet it became necessary to apply the forceps and deliver her.

To the cases just related, some of a directly opposite character may be produced; and I have myself seen delivery accomplished in a paraplegic woman with the greatest facility. The difference is due to the fact that cases are subject to infinite variety; pathological phenomena, instead of appearing separately, are associated in a thousand different ways; so that in one woman the uterine contractions alone are sufficient to expel the fœtus, whilst in another they require to be assisted by the contraction of the abdominal muscles.]

ARTICLE II.

OF TOO RAPID LABORS.

Although these are much more rare than the preceding class, yet the accidents that may result in consequence of too prompt a delivery, are quite as serious as those produced by excessive slowness; and, therefore, we must endeavor to supply an important omission made by most authors, and ourselves likewise in the first edition of this work, by devoting a few lines to the consideration of the attendant circumstances.

Some women have the unfortunate privilege, if it can be called such, of being delivered with only a few pains; and this extreme rapidity is apt to characterize every subsequent labor. What is still more singular, this peculiarity even seems to be hereditary in certain families, in which it is perpetuated for three or four generations.

In such cases, the rapid termination is always to be attributed either to an excess of energy and frequency in the uterine contractions, or to a want of resistance in the walls of the canal which the fœtus has to traverse.

Certain writers have attempted to establish a relation between the phenomena that precede or accompany the menstrual discharge in the non-gravid state, and the activity or slowness of the contractions of the womb during the labor; for they say, should the periodical flow be difficult, laborious, and painful, and the patient be tormented every month with violent colicky pains, either before or during her terms, the irritability of the uterus, and the energy of the contractions, will almost invariably be excessive in the hour of childbirth; but, on the contrary, there is reason to anticipate the occurrence of slow and feeble pains, where the woman is advised of the return of her menses only by the appearance of blood, and when they pass off without suffering. We do not know exactly to what extent this approximation is true; yet we believe that it is far from being without exceptions. But, however this may be, it is generally found that these very powerful contractions are most likely to be observed in nervous and excitable persons; appearing to depend, says Wigand, upon a high grade of irritability, the source of which, especially in hysterical patients, seems to be centred in the uterus. The moral affections are often found to have a great influence over the progress of labor; and everybody knows that where an application of the forceps has been seriously proposed to the woman, this of itself has often proved quite sufficient to bring on strong and powerful contractions of the womb, by the fears which the instrument gives rise to, even though they had been languishing before.

In certain eruptive fevers, scarlatina especially, the pains very frequently exhibit this character, and the child is then expelled with an unusual rapidity; but it is difficult to decide whether this circumstance is not rather owing to a want of resistance from the soft parts, which, like all the muscular apparatus, have been enfeebled by the disease.

The same thing also occurs in certain strong, robust, and plethoric women; here, however, the contractions are very strong from the commencement of labor; they are very painful, last for a long time, and are separated by short intervals. While the pain lasts, the patient cannot resist the urgent desire to bear down, and forcibly contract all the muscles of her body; she is much more irritable than usual, and there is something peculiar in her attitude; the head is hot; the face red and puffed up; and the pulse full and accelerated. In some instances, the intervals are scarcely perceptible, for one pain has hardly terminated before another begins; sometimes, indeed, the womb seems in a state of permanent contraction, which only passes off after the expulsion of the fœtus. The belly is then very hard; the whole body rigid and contracted; the woman holds her breath, seizes hold of some neighboring object, and, making a loud cry, or grinding her teeth, bears down with incredible force, and suddenly expels the child, together with the contents of the bladder and rectum.

But, after all, however forcible we may suppose the uterine contractions to be, they will hardly explain the rapidity of the delivery, unless we admit that a want of resistance in the walls of the pelvic canal exists at the same time; but may not a very large pelvis, a premature child, or a marked diminution of the normal resistance of the soft parts, so often met with in persons worn out by lingering diseases,[1] — may they not, we repeat, be considered as singularly favoring a too early expulsion of the child?

Where the phenomena of parturition take place with due regularity, the infant rarely comes into the world under seven or eight hours after the first pain, and this beneficent delay enables the parts which the child has to traverse to become prepared for the dilatation they must shortly undergo; the uterine orifice gradually enlarges; the soft parts, that line the excavation and the pelvic floor, being lubricated for a long time by the liquids exhaled from the womb, or secreted by the upper part of the vagina, become more soft and supple and better prepared for the distention they will be subjected to at the moment when the head is born; besides, their dilatation being effected under the influence of intermittent contractions, alternated by an interval of rest, is slow and gradual, and takes place without causing the patient any very acute suffering and without compromising the life of the child; but it is far different in the case before us, where the overhasty expulsion of the infant exposes it as well as the mother to grave accidents. Thus, not to speak of inertia of the organ, which will be treated of hereafter as one of the circumstances that may complicate the delivery, we must note as of possible occurrence the laceration of the perineum, vagina, and vaginal portion of the cervix, so often produced by the rapid passage of the fœtus through the pelvic canal; the prolapsus of the womb, which, not being yet sufficiently dilated to allow the child to clear its orifice, is forced down beyond the vulvar ring; the serious and sometimes fatal syncopes to which the too rapid depletion of the womb exposes the patient;[2] and, lastly, death itself, produced solely from the violence of the nervous shock caused by such pains.

The child is likewise exposed to real danger; for if the membranes are ruptured and the waters entirely discharged early in the labor, it must be apparent that, when the pains become permanent, the umbilical cord might be compressed between the fœtal surface and the uterine wall, or that the infant itself might suffer from the direct pressure it then undergoes. On the other hand, if the woman, supposing herself only at the commencement of her labor, should happen to be still standing or walking when surprised by these violent pains, the child may be forcibly expelled, and, striking against the floor, be killed, perhaps, by the severity of the fall; besides which, the umbilical cord is stretched from its placental insertion to the navel, and, if its rupture does not result in consequence, the traction made upon the still adherent after-birth may be sufficiently great to depress, or even to invert the womb completely; though this latter circumstance is an exceedingly rare one. A rupture of the cord has been observed much oftener; but this is seldom attended with much danger, so far as the child is concerned, because the laceration usually occurs at two or three inches from the navel, and because, by tearing the umbilical vessels, it is likely to prevent a mortal hemorrhage, even should the pulmonary respiration not be established immediately.

---

[1] This want of resistance from the soft parts may be met with in women who are otherwise healthy, as occurred in a case reported by Dr. Rigby, where a patient, in the enjoyment of good health, was delivered by two pains; the first of which aroused her from a sound sleep, and the second expelled the child into the bed.

[2] There is no difficulty in explaining the production of syncope in this case, for the womb, being distended by the product of conception, necessarily exercises a greater or less degree of compression on the large abdominal vessels; and when the fœtus is slowly delivered, as in a natural labor, this compression diminishes in the same proportion, and the blood returns in a very gradual manner into the great trunks, in which its course was before impeded; but in the case before us the depletion of the uterus is sudden, and the vessels are relieved all at once from the strong pressure they previously experienced, the blood flows into them in abundance, and goes in but small quantities to the brain: whence the latter, deprived of its natural stimulus, no longer acts on the heart, &c., &c.

Treatment.—Where there is reason to believe that the child is very small, as it would be in a case of premature labor, or if previous deliveries had led us to suppose that the pelvis is larger than usual, the woman ought to lie down on the occurrence of the very first pain, and she should avoid bearing down or contracting the muscles subjected to the influence of her will, as much as possible, during the pain; the same object would be materially aided by applying a moderately drawn bandage around the abdomen (Rigby). Finally, every precaution is to be taken to retard the rupture of the membranes as long as possible.

If, notwithstanding these precautions, it is found that the inferior part of the uterus is strongly pressed downward towards the floor of the pelvis, or even through the vulvar orifice, it must be carefully sustained until the cervix is sufficiently dilated to permit the free passage of the head. We might, like M. Nægèle, apply a large T bandage in front of the vulva, extending up over the prominent part of the womb, and having an opening at its centre corresponding to the orifice of the vagina.

If the patient had been delivered too rapidly in her previous pregnancies, opiates might be administered, either by the mouth, or by injection, for the purpose of calming the excessive irritability of the uterus. Wigand recommended venesection, which, perhaps, might be employed with advantage in strong and plethoric women, but experience has not yet determined the efficacy of the measure as a general remedy.

CHAPTER II.

OF DEFORMITIES OF THE PELVIS.

THE material obstacles which too often render spontaneous labor difficult or impossible, are exceedingly numerous, and depend either on the mother or child. The diseases and deformities, or faulty direction of the canal which the fœtus has to traverse, are naturally included among the first; and to the second we must refer the diseases and malformations of the infant itself, as also the unfavorable positions in which it may present at the superior opening of the pelvis. We shall commence our description with the obstacles appertaining to the mother's organs, and will first treat of deformities of the pelvis.

Whenever the pelvis departs from the dimensions heretofore described as e normal ones, it is said to be deformed; which, as the reader will readily derstand, may imply either an enlargement or a diminution of the average ze; and this explains the division, admitted by accoucheurs, into pelves eformed by excess of amplitude, and those deformed by excess of retracon. I say by *excess* of amplitude or of retraction, for it must not be supposed that a pelvis is reputed to be malformed, whenever it does not exactly resent the dimensions before given as the ordinary standard; because its development is subjected to the influence of the same laws that regulate the whole organism, and we all know what great varieties those laws exhibit in their accomplishment. Therefore, as a few lines, more or less, do not constitute a deformity, we shall only include under the title of malformed pelves those which, from their excessive size or narrowness, are capable of producing notable difficulties in the exercise of the puerperal functions.

§ 1. Of the Pelvis Deformed by Excess of Amplitude.

A large pelvis is not always a favorable circumstance, as might at first sight be supposed; because, if the amplitude is too great, it exposes the woman to serious accident, both in the non-gravid, the pregnant, and the parturient state. Thus, in the unimpregnated condition, the uterus, not deriving an adequate support from the walls of the excavation, and being free and movable in an overspacious cavity, is much more liable to the various displacements known as descent, anteversion, and retroversion of the womb; which accidents are then the more unfortunate, as they are the more difficult to remedy.

During gestation, the womb, finding more space than usual in the pelvic cavity, remains there until a much more advanced period of pregnancy, and the volume of the organ, by compressing the rectum and the bladder, often occasions an excessive tenesmus in these parts, which proves very distressing to the patient; sometimes, even the discharge of the urine and fecal matters is impeded, besides which, varices, hemorrhoidal tumors, or a considerable infiltration of the lower parts, are found to be developed, in consequence of the mechanical obstacle to the circulation in the inferior extremities. If this excess of amplitude is restricted to the excavation, while the straits vary but little, if any, from their normal dimensions, the fundus of the womb is often turned back into the hollow of the sacrum; and, somewhat later, when its volume is too great to permit a longer sojourn in the lesser pelvis, it meets with difficulties at the superior strait which it cannot surmount; and the impediment then offered, in either case, to the ulterior development of the organ, frequently brings on an abortion. At the end of gestation, the head engaging early at the superior strait, gets low down into the excavation, and presses on the neighboring parts; whence all the unpleasant symptoms that had accompanied the outset of pregnancy are found to be renewed in its latter months.

During labor, the excess of amplitude of the pelvis exposes the woman to all the dangers that may result from a too rapid delivery: for, if she brings into play the voluntary muscles, long before the proper dilatation of the os uteri, or bears down too strongly during the pain, the organ, being imperfectly sustained by the osseous walls of the canal, may be forced down as far as the vulva; and, indeed, be driven completely beyond the parts of generation; or, possibly, the circumference of the cervix uteri may yield, and thus give rise to a laceration. Supposing the dilatation is already perfected, then the child, being urged along by the energetic and repeated contractions of the womb, and not encountering a due degree of resistance on the part of the straits, speedily reaches the perineum, and tears its way through, because the latter has not yet had time to become distended. The expulsion of the fœtus may thus take place at a moment when the patient and her attendants believed it still distant; and hence, the absence of the ordinary precautions, and the erect position in which she may happen to be, will expose the child to a fall on the floor, or produce a premature separation of the placenta, a rupture of the umbilical cord, or an inversion of the womb; and, last of all, the womb, from being suddenly emptied, is sometimes affected with inertia, and becomes the source of a profuse flooding.

After delivery, a very large pelvis permits the uterus, notwithstanding its volume, to sink down into the excavation, and the compression thereby produced on the adjacent organs may become the cause of an inflammation that is always to be dreaded. It is further evident that an excess of amplitude must favor the displacement of the organ; and it is highly probable that the cases of retroversion reported by Martin, of Lyons, and Vermandois, as having occurred in the first few days immediately following the delivery, were owing to this circumstance. (*Martin*, 158.)

The indications for treatment, which malformation of the pelvis, from excess of amplitude, present, are exceedingly simple; for all that we have to do is to keep the patient recumbent throughout the labor, and recommend her not to aid the pains in any wise, and particularly not to bear down until the os uteri is fully dilated. Where this process is not yet completed, and the cervix, pressed down by the head, appears at the vulva, we must endeavor to push it back during the interval, and then, by supporting it with the hand, oppose its escape during the contraction.

For the indications to be fulfilled during the progress of gestation, we refer to the pages in which are studied the rational signs of deformities of the pelvis, and the indications presented by displacements of the uterus during labor.

§ 2. Of the Pelvis Deformed by Excess of Retraction.

Among the various conditions necessary to a spontaneous labor, there is one whose importance cannot be contested, namely, that a just proportion exist between the dimensions of the canal, and those of the body that must traverse it; for whenever this relation does not appear, whether owing to a retraction of the pelvis or to an abnormal size of the child, the delivery is no longer possible; and whenever this disproportion is carried to an extreme, we have only to choose between two resources that are equally disastrous in their consequences, that is, to diminish the volume of the infant, or to enlarge the way it has to pass through. The retractions of the pelvis, therefore, are the most terrible accidents that can occur in the practice of our art, and their importance, in every point of view, sufficiently warrants the detail into which we are about to enter.

The various degrees of retraction, the differences in their seat, and the varieties of form the pelvis then assumes, are so numerous, that it is indispensably necessary to adopt some general arrangement; to collect them into classes, to form groups, and then to attach these to certain principal types that are easily recognized; the number of which, however, to aid their acquisition by students, should not be too great. After having thus classified the different varieties of deformities from retraction, we must study their principal characters, and endeavor to point out their causes, their mode of development, the means of recognizing them, and, lastly, the indications for treatment that each of them presents.

ARTICLE I.

PATHOLOGICAL ANATOMY.

As regards their form and external configuration, the retracted pelves may be divided into two very distinct groups; for either the pelvis, although greatly retracted in all its dimensions, is properly formed, and presents no irregularity in its exterior aspect, or else the retraction affects only one or more of its diameters (the others maintaining very nearly their normal length), and this partial alteration completely changes its form.

§ 1. Of the Simple Contracted Pelvis, without Curvature or Malformation of the Bones. (Absolute Contraction.— *Velpeau.*)

Before the researches of Professor Nægèle, whose principal works on the pelvis will soon be disseminated throughout France, by means of the translation just published by M. Danyau, there was scarcely any mention made of this variety of contraction in the leading classic works; for most of the French and English authors merely stated that narrowness is rarely met with in all parts of the pelvis at one and the same time, and that it is still more rarely carried to a point demanding the intervention of art.

It was reserved for M. Nægèle to point out the importance of this particular variety. In his collection, he numbers four pelves that are contracted throughout, and all their diameters are one inch less than the normal dimensions; these all required either the Cæsarean operation or the mutilation of the fœtus. Three of them were obtained from women of ordinary stature, the fourth belonged to a dwarf thirty-one years of age, and only forty-six inches in height, though otherwise well formed. As regards the respective lengths of their different diameters, and the form of the pubic arch, each one of these presents the characters of a regularly-formed pelvis, whose dimensions may be supposed to have been reduced; and, as to the condition of the bones, that is to say, their color, strength, and texture, there is no departure from the healthy standard. In one of them there is even a tendency to a greater density of the osseous tissue. Further, these pelves have nothing in common with those deformed in consequence of rachitis, as the consistence, density, thickness, and size of the bones, and the regular shape of the pubic arch, sufficiently prove; besides, the individuals from whom they were procured, presented no traces of that affection during life; and the examination of other parts of the skeleton fully confirmed this distinction, which we hope to prove in a still more decisive [illegible] hereafter, when the causes and particular development of this species of contraction shall be studied.

M. Nægèle admits two distinct varieties in the malformed pelvis under consideration. In one, he says, the pelvis, with respect to its thickness, strength, texture, and indeed all the physical characters of the bones, size excepted, does not differ from a normal one; and it is met with in persons of either a small, an ordinary, or a high stature, who may be otherwise well formed and thin, and whose external appearance would not cause the least suspicion of such a formation; whence it can only be recognized by a local exploration. In the other, the pelvis is wholly different; for, as regards their volume, substance, and strength, the bones exhibit the characteristics of childhood; and the same remark is applicable to their mode of union with each other. This variety is only observed in very small individuals, such as dwarfs; and the relations of the diameters with one another, and the form of the pubic arch, are such as are found in the girl, when the sexual system has just completed its development. Thus, for example, in the dwarf before cited, whose height was but forty-six inches, the pelvis had the following dimensions, viz.:

From the promontory of the sacrum to the point of the coccyx,	3¼ inches.
The antero-posterior diameter of the superior strait,	3½ "
Transverse diameter " "	3¾ "
Antero-posterior diameter of the excavation,	3¼ "
Transverse diameter " "	3⅛ "
Transverse diameter of the inferior strait,	3⅕ "
Depth of the spmphysis pubis,	nearly 1 inch.

§ 2. OF THE PELVIS CONTRACTED BY THE CURVATURE AND MALFORMATION OF THE BONES. (Relative Contraction.— *Velpeau.*)

In those cases where the pelvis is contracted by the curvature and malformation of its constituent bones, the deformity may be referred to one of the three principal types described by M. Dubois: that is, either to a flattening from before backwards, to a compression on the sides, or to the depression of the anterior and lateral parts; the first variety, or flattening, shortens the antero-posterior diameters, the lateral compression diminishes the transverse ones, and the depression of the antero-lateral walls contracts the oblique diameters. Again, each of these varieties may affect either the superior strait, the inferior strait, or the excavation, though frequently both straits are contracted at the same time.

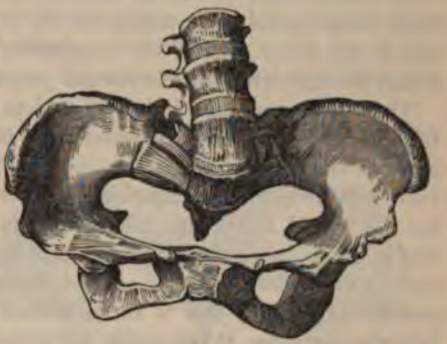
A. The *flattening from before backwards*, or shortening of the antero-posterior diameter, results from a more or less marked approximation of the anterior and posterior pelvic walls; and this species of malformation exhibits several varieties, as regards the extent of contraction, whether in height or width. For instance, the superior strait alone may be contracted, while the excavation retains its normal capacity; this phenomenon is caused by the unusual curvature of the sacrum, which is sometimes so bent anteriorly as almost to represent an obtuse angle at its middle part, whereby the base of the bone is thrown forward in such a way as to singularly augment the prominence of the sacro-vertebral angle. But the contrary may also occur, and the sacrum, instead of presenting an anterior concavity, be quite plane, or, occasionally, even convex in front; and then the excavation is contracted simultaneously with the superior strait, in its antero-posterior diameter, and it really seems as if the sacrum, having lost its natural curvature, had been pushed forward in totality.

The shortening of the antero-posterior diameter of the superior strait sometimes accompanies an enlargement of the corresponding one at the inferior strait. This, indeed, is the most frequent arrangement, and is what generally takes place when the sacrum, yielding under the weight of the trunk transmitted to it through the spinal column, becomes tilted, that is, the base is projected forward, while its coccygeal extremity is forcibly pushed backward.

Lastly, the coccy-pubic and the sacro-pubic diameters may be shortened, at the same time, if it should happen that the sacrum, instead of performing the tilting movement just alluded to, yields in such a way that its two extremities are thrown forward; the anterior curvature is then greatly augmented, and consequently the corresponding diameter of the excavation enlarged.

In the approximation of the antero-posterior walls, the sacrum is nearly always the displaced bone; but although much more rare, a flattening of the anterior wall is also met with; and then the symphysis pubis, instead of presenting a convexity in front, is perfectly flat, or even (as in one instance represented by Madame Boivin) presents a depression, which seems to protrude inwardly towards the prominence of the sacrum. This double inclination of the pubis and sacrum towards each other, gives to the superior strait the form of the figure eight; that is, its plane is divided into two rounded portions on the sides, corresponding to the iliac fossæ, and is separated in the middle by a restricted part, of variable width. If the depression is considerable, the antero-posterior diameters of both straits, and of the excavation, must evidently be affected by it.

Fig. 93.

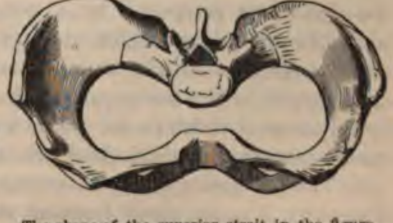


A pelvis, in which the contraction of the sacro-pubic diameter is produced by the unusual prominence of the sacro-vertebral angle.

But there is yet another way in which the symphysis pubis may contribute to the narrowness of the pelvis; for instance, its vertical extent is sometimes much greater than usual, and this extraordinary length gives rise to what is termed the *bar* pelvis; or the same effect may be produced by an excessive inclination backwards at its lower end.

Again, the coccy-pubic diameter may

Fig. 94.



The shape of the superior strait in the figure eight pelvis.

be shortened, it is said, by an elongation, or rather an almost horizontal direction of the coccyx, and more particularly by an immobility of the sacro-coccygeal articulation. This latter circumstance has been invoked in explanation of the slowness and difficulty of first labors in middle-aged women; but, as M. A. Dubois has remarked, the delay in the delivery of the head in such persons does not usually depend on an immobility of the coccyx, but upon the rigidity of the soft parts, which then offer great resistance.

B. The *compression of the lateral walls*, by which the transverse diameter is shortened, is the rarest of all the deformities, at least so far as concerns the superior strait and upper part of the excavation; for the inferior strait, on the contrary, the approximation of the two ischial tuberosities, which constitutes this species of deformity, is quite as frequent as the shortening of the coccy-pubic diameter; the malformation resulting from the approach of those tuberosities, as well as that of the branches of the pubic arch; this latter then assumes the triangular form peculiar to the male sex. Besides which, the lower part of the excavation may be notably diminished in the transverse direction, by the inward projection of the spines of the ischia.

The transverse contraction is seldom as well marked as the flattening from before backwards, especially at the superior strait, where it is, in general, limited to diminishing the bis-iliac diameter from a few lines to an inch in its length, by elongating the antero-posterior one to the same extent; for the coxal bones are then less curved, and the sacrum is thrust backwards, while the pubes are more prolonged in front. Of course, the upper strait will be more or less altered in form according to the degree of compression, for where this is inconsiderable, its periphery is nearly circular; but when greater, it represents an ovoid, the larger extremity of which is posterior.

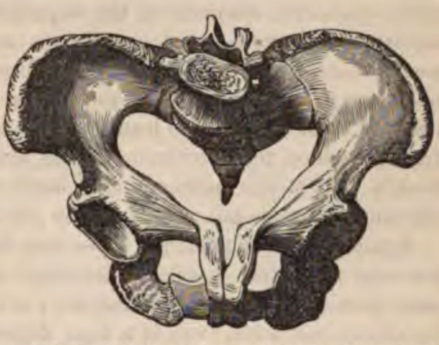
Another variety of transverse contraction is owing to the fact of the pelvis being less developed in one of its halves than in the other, and consequently to its exhibiting a less degree of curvature in that part than upon the opposite side. In this case, the articulation of the spine with the sacrum no longer corresponds to the middle of the pelvis, and the vertebral column is found nearer to the hip of the contracted side; the transverse diameter is likewise diminished at the inferior strait by reason of the obliquity of the entering part of the coxal bone. The antagonism before alluded to, as existing between the antero-posterior diameters of the superior and the inferior straits, whereby the elongation of one most frequently coincides with a shortening of the other, rarely exists in the transverse direction; the deformity produced by a congenital displacement of the femurs is probably the only condition in which the transverse diameter of the inferior strait augments at the same time that the bis-iliac one diminishes; the enlargement in the lower part of the pelvis, in this instance, being marked by an unusual width in the pubic arch, great obliquity of the ischio-pubic rami, separation of the ischial tuberosities, &c. (See art. *Causes*.)

C. The *depression of the antero-lateral-walls*, which diminishes the oblique diameters, is much more frequent than the preceding variety, though it is more rare than the flattening from before backwards, and it may exist on one or both sides at the same time. This deformity consists, essentially, in the flattening, or inward projection of the coxal bone, at the part corresponding to the cotyloid cavity, and to the junction of its three constituent pieces; whence there results at this point a greater or less diminution of the curve which the pelvic circumference usually describes; and when existing in a high degree, the curvature is even reversed, its convexity being turned towards the sacrum, while, at the same time, the pubis departs from its normal transverse direction and runs almost directly forwards; so that the deformity is produced by the coxal bones having then assumed the form of an old italic *S*, instead of presenting a regular arch.

Where this takes place to the same extent on both sides, the pelvis maintains a degree of symmetry, and the superior strait is shaped like the trefoil leaf; that is, it presents three lobes, one anteriorly, which corresponds to the more acute angle of the pubis, and two posteriorly and laterally, formed by the union of the iliac bones with the sacrum. But it far oftener happens that the deformity is more marked in the coxal bone of one side than upon the other, and then the shape of the pelvis is the more irregular as the deformity of the ossa innominata is greater.

Where this double disfiguration of the hip-bones exists in a high degree, more especially when it affects the anterior pelvic wall, it vitiates both the oblique and antero-posterior diameters at the same time. In fact, these bones are then approximated in a parallel manner, being only separated from each other by a slight distance, for the extent of an inch or two, while the rest of the pelvis is comparatively regular; and hence, although the symphysis pubis may be at the normal distance from the sacro-vertebral angle, yet it is not the less true that the antero-posterior diameter of the superior strait will be virtually shortened in all its forward part comprised in the fissure left between the two deformed antero-lateral walls, because this contracted portion cannot contribute in any wise to the passage of the fœtal head.

FIG. 95.



A pelvis in which the sinking-in of the antero-lateral walls exists on both sides.

Again, we may remark, with M. P. Dubois, that as the anterior arch of the pelvis has but very little depth at the point corresponding to the depression of its lateral walls, and as the surface compressed by the head of the femur occupies the largest portion of it, the whole of that region must almost necessarily be pressed in; and, consequently, that the shortening must affect all the diameters at once, those of the excavation and of the abdominal and perineal straits; though the retraction is in general less marked at the inferior strait than elsewhere, because the lower part of the ischium is not carried so far backwards as the cotyloid region.

As to the variety of deformity recently described by M. Nægèle, th celebrated professor of Heidelberg, under the title of *oblique* contractio we may evidently refer it also to a shortening of one of the oblique diameters, and shall describe it hereafter. (See *Causes*).

This remark naturally leads us to the important observation, that hitherto we have considered each of the species of deformity that may alter the various pelvic diameters, as being separate and distinct, since there are some which may exist alone, and only change the corresponding diameters; but, besides the fact that different points of the pelvic circle may be simultaneously deformed, and thus contract the pelvis in several directions at once, the form and extent of the pelvis are such that it is difficult for a flattening, a lateral compression, or a depression of the antero-lateral parts to take place, even separately, without its being thereby contracted in several of its diameters. Let us suppose, for instance, that one of the oblique diameters has been diminished by the depression of the bottom of the acetabulum; and it must be evident that, should the depression be considerable, the body of the ischium cannot be thus thrust inwards and backwards, without drawing along with it at the same time, some considerable portion of the anterior part of the pelvis, and of the arch formed by its lateral half, and consequently without contracting, more or less, certain of the antero-posterior and transverse diameters. Again, where the sacro-vertebral angle, from being projected forward, diminishes the length of the antero-posterior diameter of the superior strait, we have supposed that it followed the sacro-pubic line, in its movement of progression; but, as readily foreseen, it would most often prove otherwise, for the very frequent obliquity in the direction of the forces transmitted through the vertebral column, must compel it to lean towards the right or the left, as well as to the front; whence, the shortening of the antero-posterior diameter necessarily entails that of the sacro-cotyloid interval, and, as a consequence, narrows the whole corresponding half of the pelvis.

Again, the three principal types may be found united in the same pelvis, whereby the latter is greatly deformed in all its diameters. This occurs more particularly in the deformities produced by malacosteon, but it is also sometimes met with, even in a high degree, in cases dependent on rachitis, as fully proved by the facts observed by M. Nægèle.

From all this, we learn what great diversities of shape may be presented by deformed pelves. Madame Lachapelle has gone so far as to designate these varieties by the titles of the *reniform*, the *triangular*, the *bi-lobed*, the *rounded*, the *oval*, the *cordiform*, the *trapezoid*, the *pyramidal*, and the *three-lobed straits;* but she has greatly multiplied the species without any practical utility, and she further admits that there are numerous undescribed varieties for each of these orders.

The Degree of Contraction.—The two extremes of contraction of the straits are from three and three-quarters to four inches for the highest, and from two to three lines for the least, and between these two the pelvis may exhibit all the intermediate degrees of narrowness. The causes which produced the deformity greatly influence the degree of contraction, and in this point of view they may be arranged in the following order, viz., malacosteon, rickets, congenital luxations of the femur, deformities of the spinal column, &c.; we shall take occasion hereafter to revert to the mode in which each of these acts.

Of the Variations in the Depth of the Pelvis.—The vices of conformation,
t spoken of, rarely exist without modifying the depth of the pelvis, in a
ater or less degree; which circumstance has been particularly dwelt
on by M. Bouvier, in the able work presented by him to the Institute.
r instance, the depth may either be augmented or diminished by the vari-
e inclination of the expanded portion of the iliac bones, or of the branches
the pubic arch, as also by the diversities in the length of the sacrum.
Sometimes this latter bone is very short, its contraction being produced
ner by an excess of the anterior curvature, which brings the two extrem-
s nearer to each other, or by an arrest of development.

Occasionally, the iliac fossæ are elevated, as if they had been forcibly
ssed from without inwards, thus giving it the appearance of a male
vis; and this elevation may be further augmented by exterior and lateral
ssure, whereby the bones are rendered quite vertical, and the normal
pth of the pelvis is greatly increased. The contrary may occur where
iliac crests, from being strongly depressed and thrust outwards, enlarge
margin of the pelvis, but evidently diminish its height. It would be
ficult to misinterpret the influence of the weight of the viscera in such
ses when there is no congenital deformity in question. (Bouvier, *op. cit.*)

In conclusion, a widening of the pubic arch must clearly diminish its height
a corresponding extent; while the latter, as well as the whole depth of the
lvis, must be increased, where the ischio-pubic rami are very close together.

ARTICLE II.

THE CAUSES AND MODE OF PRODUCTION OF THE PELVIC DEFORMITIES.

For a long time the vices of conformation of the pelvis, as also most of
e deformities occurring in the skeleton at large, were attributed to the
eration of a single cause, rachitis; but the more careful researches of
odern surgeons enable us, at the present day, to ascertain more precisely
e effects of rickets on the osseous system, and to appreciate the influence
at other general or local diseases may have over the perfect or the defec-
ve conformation of the pelvis. And here I must again extract largely
om the valuable works of Nægèle, Bouvier, Guerin, Sedillot, and others.

An examination of facts clearly proves that the pelvis may be deformed
der circumstances where there has been no rachitis properly so called;
d where causes that are purely mechanical in their operation have altered
e configuration of its constituent parts at a period when their power of
sistance was inconsiderable, not in consequence of any pathological soft-
ing, but solely from the tender age of the patient, or the feebleness of its
nstitution. And hence, as regards the causes that produce the changes
their form, we might classify all the irregular pelves under five principal
pes, namely:—

1. Deformity from absolute contraction.
2. Deformity from rachitis.
3. Deformity from osteomalacia.
4. Oblique oval pelvis.
5. Deformity consecutive to a previous deformity of some other part of
skeleton.

§ 1. Pelves Deformed by Absolute Narrowness.

To complete our remarks on the causes of pelvic deformities, we have yet to sum up the various opinions that have been given forth concerning those vitiated by absolute narrowness. According to most authors, the absolute contraction of the pelvis results from an arrest of development, whereby this part still retains, after puberty, the principal characters that it had during childhood, and approaches in its form more or less closely to that of the male. But, as M. Nægèle remarks, if this were really the case, the relation of the diameters with each other, and the character of the pubic arch, should be such as are observed in the young girl and the male. But all the known pelves of this variety exhibit quite the contrary. Nor are they more in consonance with that of a rickety person; and, besides, the rest of the skeleton has none of the characters appertaining to this disease.

Wherefore, it is certainly the wisest plan to say, with the illustrious Heidelberg Professor, that we have no positive data concerning the causes that give rise to the general narrowing of the pelvis; and that such pelves, as well as unusually large ones, should rather be considered as a freak of nature, belonging to the same category as a want of proportion in the head, which is not unfrequently found too large, or too small, relatively to the rest of the body.

§ 2. Of the Pelvis Deformed by Rachitis.

We are not about to enter here into a detailed consideration of the causes that preside over the development of *rachitis;* for the general phenomena produced by them, and, more especially, the greater softening, fragility, and flexibility of the osseous tissue, are so well known to pathologists that we need only mention them; but our present duty is to study their influence in the production of the deformities of the pelvis.

But this softening, or want of resistance on the part of the bones, is not of itself sufficient to explain the various deformities exhibited by the pelvis; because, except in certain very rare cases, in which the osseous tissue is almost gelatinous in its consistence, it must be evident that the bones can only give way and become distorted by the action of an exterior force, without which their conformation would remain intact. For where rachitis affects them, it has no other immediate consequence than to diminish their solidity, and of itself contributes in no wise to the alteration of their shape; we must seek in the influence of some external force, which is wholly independent of the principal disease, for the cause of the deformity. Now, this exterior force sometimes resides in the muscular action, though still more frequently (so far as regards the pelvis) in the weight of the parts it has to support; for, being placed, as we have elsewhere described, below the trunk and directly upon the lower extremities, to which, in the erect position, it transmits the whole weight of the upper parts of the body, the pelvis is found in the most favorable conditions for the production of deformity. The weight of the trunk, which, in the erect posture, is transmitted from the lumbar vertebræ to the heads of the femurs in the direction of two oblique lines that intersect the sides of the superior strait, manifestly tends to augment the curvature of the posterior part of the ilium, and to depress the osseous circle which the pelvic cavity represents; and this weight, acting at first more especially on the base of the sacrum, has a tendency to push the latter insensibly forwards. The pubic bones would be equally pressed towards the sacrum, though in such a manner that their posterior extremity (the one nearest to the acetabulum, which supports the weight) gets somewhat nearer to the sacro-vertebral angle than does their anterior or symphyseal extremity; whence we may learn why the contractions of the pelvis oftener affect the superior strait than other parts; and why, at this strait, the antero-posterior and oblique diameters, and the sacro-cotyloid interval, are far more frequently contracted than the transverse ones.

And it will be equally evident why, when the weight acts more particularly on one side of the pelvis, the collapse is more marked in that direction, if we bear in mind the change that then takes place in the centre of gravity from the inclination of the spine, the curvature of which so often precedes the deformity of the pelvis, as also the very unequal pressure of the weight of the body on the two sides of the pelvis, where a difference of length in the lower extremities depresses one of the coxal bones more than the other; whereby the acetabulum of one side is thrown almost directly under the sacrum, and at the same time receives the weight very obliquely. (Bouvier.) It is further evident that the customary attitude of the individual, and the nature of her exercises, must likewise add to the irregularity in the figure of the pelvis.

If the child is in the habit of sitting much, the weight transmitted by the lumbar vertebræ may likewise press the sacro-vertebral angle forward; but the sacrum also often yields, and its base is carried forward simultaneously with the point of the coccyx, and the antero-posterior diameters of both the superior and the inferior straits are affected.

The lateral compression, operating from one side to the other, which is far less common than the preceding, or the shortening of one or more of the transverse diameters, supposes an action diametrically opposite, and it generally results from a lateral force acting from without inwards; which force may be referred either to the weight of the body, where the child uniformly reposes on its side, or to the unequal pressure of some improperly adjusted bandage, or the arms of an awkward nurse. But if, on the contrary, the infant habitually leans more towards one side than the other when seated, one of the ischial tuberosities, having to support a more considerable weight than its fellow, may be distorted inwardly; sometimes even the pressure will be applied successively to each, with the effect of bringing them very near to each other.

Rachitis affects first the bones of the lower extremities, and ascends gradually to the upper parts; in a word, it has an upward tendency. From this results a most important practical consequence, namely, that a deformity of any part of the skeleton from rachitis implies, almost necessarily, deformity of the bones situated below it.

Rachitis is a disease peculiar to infancy, and this peculiarity of only exerting its action during the early years of life, satisfactorily explains how the affection may have two different modes of acting on the pelvis; one of which consists of a softening of the bones, and their consequent yielding;

and the other, of a sort of arrest in their development. "Thus," M. Guerin says, "it would appear from my researches that most of the bones of a rachitic skeleton, when compared with those of a normal one, exhibit an arrested development as regards their different dimensions; which reduction, *independently of what results from the deformity of the bones*, may amount to one-half of their ordinary size; and further, that this reduction is generally greater in the lower parts of the skeleton, and gradually diminishes from below upwards, from the bones of the legs to the femurs, from these latter to the pelvis, and from the pelvis to the upper extremities and spine, &c." It is, therefore, on the lower extremities particularly, and on the coxal bones, which are appendages of them, that this arrested development exerts its action. "Whence," says M. Dubois, "it necessarily results that the ossa innominata are generally much less developed in rachitic pelves than in others; and this disposition must powerfully contribute, together with the deformity that usually accompanies it, to contract the limits of the cavity, which these bones, in a great measure, circumscribe; and I am the more convinced of the importance of this fact, since, in several instances of deformity occurring in individuals known to be rachitic during infancy, it has appeared to me that the yielding of the bones to the degree in which it existed would have been wholly insufficient to create such insurmountable difficulties, if the bones themselves had been as fully developed as they ought to have been." (*Thèse de Concours.*) And we may mention, as another fact bearing on the same point, that the pelvis of the patient on whom M. Moreau performed the Cæsarean operation, had experienced the double influence of rachitis just mentioned; for, though but little deformed, its antero-posterior diameter was only two and three-eighths of an inch in length.

This influence over the development of the pelvic bones is dependent solely on the tender age at which the affection appears, since it occurs in childhood, as stated, that is, at a period when the pelvis is far from having acquired its perfect organization; whereas malacosteon does not appear until after puberty, in other words, at an age when the ossa innominata have reached their normal development; and, therefore, although it may soften the bones, it cannot oppose their growth.

Lastly, this action is not set aside by the cure of the disease, but it continues to be felt during the whole period of development, so that, says M. Guerin, the sum of reduction exhibited by the bones of rickety adults, is made up of two successive results, namely, of the reduction dependent on an absolute arrest, or a mere diminution of growth during the disease, and of that caused by a retarded growth subsequent to the malady. This is an important practical remark, showing how far the influence of rachitis over the osseous system may extend.

To recapitulate,—rachitis produces deformity of the pelvis in two ways:

A. By altering the shape of the bones.

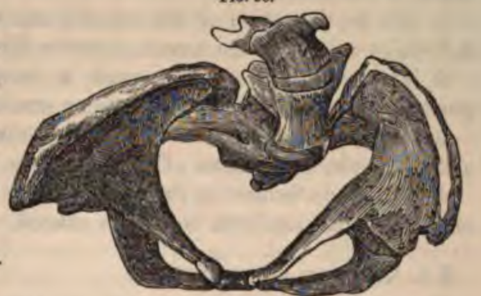
B. By arresting development.

The most striking characters of a rachitic pelvis are as follows:—

1. The antero-posterior diameter of the superior strait is always shortened, and the same is generally true for the oblique diameter. The transverse

diameter is less frequently shortened; sometimes it is normal or even lengthened.

FIG. 96.



Pelvis deformed by rachitis.

2. The sacrum is less curved.

3. The diameters of the inferior strait are usually normal, and the transverse diameter, in a certain proportion of cases, is lengthened.

4. The angle formed by the pubic arch is increased.

§ 3. DEFORMITY FROM OSTEOMALACIA.

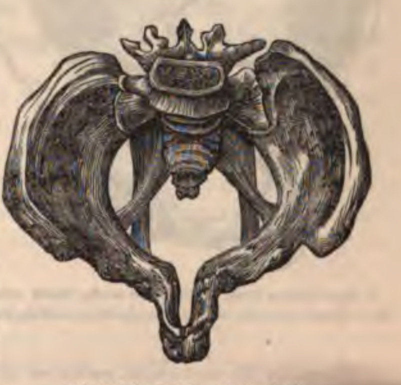
Osteomalacia, like rachitis, by producing softening of the bones, diminishes their power of resistance. Instead of appearing during infancy, it occurs only in adults, often attacking women who have previously had one or several children. The softening produced by osteomalacia is generally much greater than the loss of resistance occasioned by rachitis, whence it follows that, aside from some exceptional cases, such as the one mentioned by Nægèle, the greatest contractions of the pelvis are due to osteomalacia, which sometimes deforms the skeleton to an incredible degree.

This disease may attack any of the bones of the skeleton, though it usually begins with the pelvis.

When their softening has occurred, the bones forming the cavity of the pelvis have their shape changed as in rachitis, under the influence of two causes, namely, the weight of the parts which they are obliged to support, and the contraction of the muscles attached to them. In this case, however, as the weight of the body is greater, and the muscular action stronger, the deformities are greater also. We would add that the development of the bony system is not arrested by osteomalacia, and that the conditions arising from the various habits and motions of the patient are liable to produce peculiar deformities which have been successfully studied by Stein and Kilian.

It may be stated, in a general way, that a pelvis deformed by osteomalacia is characterized by compression of its lateral parts with projection of the pubic symphysis which is pressed forward by the approximation of the two horizontal branches of the pubis. The iliac fossæ are crowded inward, and the curvature of the sacrum is always greater than in the normal condition. The inferior strait is more deformed than the superior one; all its diameters are altered, but there occurs more especially a considerable approximation of the tuberosities of the ischia and of the ischio-pubic rami.

FIG. 97.



Pelvis deformed by osteomalacia.

To recount the peculiar characteristics of the pelvis deformed by osteomalacia, we should say:—

1. All the diameters of the superior strait may be shortened, though the deformity is least in the antero-posterior direction.

2. The concavity of the sacrum is increased, and the coccyx projects greatly toward the axis of the inferior strait.

3. All the diameters of the inferior strait are contracted: the approximation of the tuberosities of the sacrum is, however, the principal feature.

4. The angle formed by the pubic arch is far less open than in the normal condition, and may even be almost effaced.

§ 4. Oblique Oval Pelvis.

The variety of deformity recently described by M. Nægèle, the celebrated Heidelberg professor, under the title of *oblique* contraction, may evidently be referred to a shortening of one of the oblique diameters. His book on the subject has recently been translated with the greatest care by M. Danyau, who has enhanced the value of this admirable work by the addition of learned notes; but as we had induced Dr. Steege, before the publication of Danyau's translation, to prepare for us the chapter in which M. Nægèle describes the principal characters of his oblique pelvis, we submit the following translation of it, which we owe to the courtesy of our professional brother.

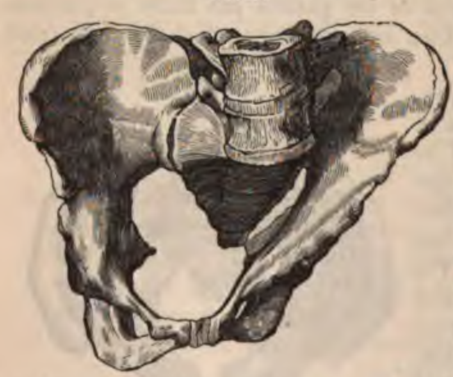
"The principal characteristics of these deformed pelves are the following, namely:—

"1. A complete anchylosis of one of the sacro-iliac articulations, or a perfect fusion of the sacrum and one of the iliac bones together.[1]

"2. An arrest of development, or an imperfect development of the lateral half of the sacrum, and deficient size or contracted opening of the anterior sacral foramina on the anchylosed side.

"3. On the same side, a reduced size of the os ilium, and, consequently, a diminished extent of the ischiatic notches of this latter; that is to say, the distance between its anterior superior and its posterior superior spinous process, as well as an imaginary line, drawn at the entrance of the pelvis, commencing at the spot where the sacro-iliac symphysis would be (if it existed), and running along the linea innominata and the linea ilio-pectinea as far as the pubic symphysis, is shorter here than on the opposite side. Further, the part corresponding to the articular

Fig. 98.



A figure taken from M. Nægèle's work, which exhibits the characters of the oblique-oval pelvis in a high degree.

---

[1] We retain the expression *anchylosis* on account of brevity, and because it is the one generally used to designate the condition under consideration; but we formally protest

surface, on the anchylosed bone, which is here continued into the sacrum without any transition, extends neither so high up, nor descends so low, as upon the opposite side, or as it would in a well-formed ilium; or, to explain myself more clearly, if we suppose the ilium and sacrum of the anchylosed side to be temporarily separated, and then reunited through the intervention of a fibro-cartilaginous disk, as occurs in the natural state, the articular surface or the junction of these two bones would be found shorter, and, of course, would not descend so low as on the opposite side, which is exempt from fusion, or as it does in a well-formed pelvis.

"4. The sacrum seems to be distorted toward the fused side, and it also has its anterior surface turned more or less towards this side, whilst the symphysis pubis is pressed over to the opposite one; in consequence of which arrangement the symphysis is no longer found directly in front of the promontory, as it ought to be, but is caused to assume an oblique position.

"5. The internal surface of the ilium, on the anchylosed half, is more flattened in that part which contributes to the formation of the pelvic cavity, and sometimes even (in cases of great deformity) is almost entirely plane; so that, for example, a line drawn from the middle, or even the posterior extremity of the linea innominata, and running along the body and horizontal branch of the pubis as far as the symphysis, will be nearly a straight line; but we have never seen an inclination inwards at this part, nor have we particularly observed that inward projection of the horizontal branch of the pubis that is found in pelves deformed in consequence of mollities ossium in the adult.

"6. The other lateral half of the pelvis, or the one where the sacro-iliac articulation still exists, likewise departs from the normal condition; although, where the obliquity is inconsiderable, we may easily deceive ourselves at first sight, and be induced to suppose that there is a natural conformation of the non-anchylosed half; such, however, is not the fact, as can be proved by supposing two pelves to be similarly deformed, with this difference only, that in one the fusion of the sacro-iliac articulation takes place on the left side, while in the other it is on the right; and then making a section of each through the symphysis pubis and the middle line of the sacrum; when, by attempting to fit the right half of the first of these pelves to the left half of the second, by bringing the cut surfaces of the two sacrums against each other, we shall find that the pubic bones are separated by an interval of from three to four inches.

"Consequently, the lateral half of the pelvis, exempt from fusion, not only participates in the abnormal situation and direction of the bones, but also in their irregular form; and this to such an extent that, if a line should be drawn on the non-fused side from the middle of the promontory, along the linea innominata and linea ilio-pectinea as far as the symphysis pubis, it would be more curved in its posterior, and less so in its anterior half, than in a normal pelvis."

against the imputation of having admitted that these bones had originally been well formed, and had only contracted this continuity of structure in consequence of some disease. Perhaps the term *synostosis* or *synezizis* would better designate the perfect fusion here alluded to.

Thence it follows:

7. A. That the pelvis is contracted obliquely, that is to say, in the direction of one of the ordinary oblique diameters, while in the other (which runs from the point of anchylosis to the opposite cotyloid cavity) it is not at all diminished, but may even be larger than usual, when the obliquity of the pelvis is greater.

"Wherefore, the superior strait, or, in other words, the surface limited by a line traced along the spines of the two pubes, and thence along the lineæ innominatæ and prolonged on the sacrum, as well as the imaginary plane at the centre of the pelvic excavation (in the place where we usually admit the middle opening of the pelvis, *apertura pelvis media,*) will resemble, strictly speaking, an oblique oval when viewed in front; the transverse or small diameter of which will be represented by the contracted oblique diameter, and its great, or longitudinal one, by the opposite oblique diameter.[1] Therefore, as regards their form, the pelves in question might very properly be designated by the title of the *oblique-oval pelvis* (*pelvis oblique-ovata.*)

"B. That the distance from the promontory of the sacrum to the point corresponding to either cotyloid cavity (the sacro-cotyloid interval),[2] as well as that from the apex of this bone to the spines of the ischia, would be less on the side where the anchylosis exists.

"C. That the distance from the tuber ischii on the anchylosed half to the posterior superior spinous process of the opposite ilium, as also that between the spinous process of the last lumbar vertebra and the anterior superior spine of the ilium on the anchylosed portion, are smaller than the corresponding dimensions of the opposite side.

"D. That the distance from the inferior border of the symphysis pubis to the posterior superior spinous process of the ilium is greater on the anchylosed bone than on the opposite side.

"E. That the walls of the pelvic excavation converge somewhat obliquely from above downwards, whereby the pubic arch is more or less narrowed, and therefore made to approach in a measure to the form of the male pelvis, as a natural consequence of the improper direction of its ramus which is turned towards the flattened pelvic wall. Of course, these two dispositions, as also the narrowing of the ischiatic notch, the diminution of the distance between the two ischiatic spines and the one-sided and defective development of the sacrum, will be in direct relation with the degree of obliquity.

"F. And finally, that on the flattened side the acetabulum is inclined much more anteriorly than in the normal state, whilst on the opposite side it is turned almost directly outwards; and hence, when examining the pelvis from in front we can look directly into the first cotyloid cavity, but the view will only graze the second, or possibly may embrace a small part of its excavation. Further, to give as clear an idea of the deformity as possible to those who have never seen a pelvis of the kind, we will observe that at first sight the pelvis looks as if it had been pressed in by some external force acting in an oblique direction from below upwards and from without inwards, and making its influence felt on the anterior pelvic wall at the cotyloid region, whilst the other half of the lateral wall has been simultaneously pressed from without inwards, at its posterior part.

---

[1] From this it is evident that the lines connecting those points, between which we are accustomed to imagine the antero-posterior and transverse diameters as passing, do not cross at right angles in the oblique-oval pelvis, and that the latter cannot be regarded as possessing oblique diameters such as are attributed to symmetrical pelves.

[2] For sake of brevity, we use this expression here in order to indicate the distance referred to, it being one which J. Burns thought it necessary to measure and establish, for the purpose of assisting in an exact representation of the form of the pelvic opening.

"Another peculiarity of these pelves is, that they only differ from each other by the degree of obliquity, and on that side only where the anchylosis takes place; whereas, in all other points, that is, in the principal characteristics of their malformation, they are as similar as two eggs. This remark is so true, that an experienced person, who was unaware of the circumstance, would be disposed to take two different specimens, if presented to him separately, for one and the same, and it would even be difficult to persuade him of his error; an instance of which we shall presently give.

"As to the other conditions of the bones in the oblique-oval pelvis (laying aside the deviations just enumerated), that is, as regards their strength, size, texture, color, etc., they do not differ in any wise from healthy bones, such as those met with in young persons exempt from all deformity. Thus, for example, none of those signs are observed in them, neither as to their form nor in other respects, which are so often found after rachitis or malacosteon; for if the existing deformities were disposed to disappear, all the pelves we have yet had an opportunity of examining would bear a general resemblance to well-formed ones; most of them were of the medium size, and the others were either above or below it, but in no one of the cases that we have particularly traced out has there been rachitic diathesis, and in no one did the phenomena, symptoms, or morbid modifications exist, which would have either preceded or followed the English malady, or mollities ossium, after puberty; and further, in no instance could the action of external prejudicial influences, such as falls or blows, etc., be detected, and there were never any antecedent pains or lameness; although, in one instance, we suspected a slight limping, from seeing the patient walk, but other skilful persons, who were present at the examination, did not detect it, and the relatives and all the family of the woman in question positively declared they had never remarked anything of the kind.

"In two of the specimens of this variety in our collection which have the lower vertebræ attached, the spinal column is straight in the lumbar region; but in the others it is inclined on the side exempt from anchylosis. In all that are provided with the lumbar vertebræ, the anterior face of the bodies of these bones is more or less directed towards the anchylosed side."

One circumstance yet remains to be explained, that is, the complete fusion of the sacrum and ilium together, and the consequent disappearance of the sacro-iliac articulation on the contracted side. Now, is this anchylosis congenital? Is it the result of some inflammation occurring after infancy? or is it to be attributed to the curvature of the vertebral column? We confess that sufficient materials are yet wanting to decide the question, although M. Nægèle seems to think that this fusion, as well as the deformity of which, in his estimation, it is the essential character, results from an anomaly of original development; "but," he adds, in conclusion, "I am not prepared to decide positively." (For further details, see M. Danyau's translation.)

Whether congenital, or the consequence of an accidental disease, Professors Gavarret and Paul Dubois regard this anchylosis as the cause of the flattening of the ilium upon the same side. When, says M. Dubois, one of the sacro-iliac symphyses is affected with anchylosis, the corresponding coxal bone becomes flattened, and the same alteration is produced on both sides when the two symphyses are ossified. For my own part, I cannot admit this relation of cause and effect, for there is nothing to prove that in M. Nægèle's oblique oval pelves, the deformity of the ilium had been preceded by anchylosis. On the contrary, we have shown that, as M. Nægèle himself acknowledges, there are pelves which present all the characters of the oblique oval ones, *excepting the anchylosis of the sacro-iliac symphysis.* How, then, can the anchylosis be regarded as causing the deformity?

Dr. Falri thinks that this deformity is occasioned by compression of the pelvis during intra-uterine life, during labor, or during early childhood.

The reader will see, by the translation just given, that M. Nægèle attaches a very great degree of importance to the anchylosis of the sacro-iliac articulation, which he makes a pathognomonic character of the deformed pelvis, described by him under the name of the *oblique oval;* but, if I might hazard an opinion after such high authority, I should unhesitatingly reject this proposition, because there are numerous pelves which present all the characters of these oblique ones, described in the monograph of the Heidelberg professor, and yet in which there is no fusion of either sacro-iliac articulation to be found. M. Nægèle himself, with that candor characteristic of the truly learned man, speaks in his admirable work of pelves that were similar to those previously described by him, and which only differed from them by the absence of anchylosis. He alludes to several others, and states that he knows of the existence of many more, the exact description of which has been promised him. I shall have occasion hereafter to revert to this subject, but I cannot refrain from saying now, that if the anchylosis is no longer to be considered as a constant phenomenon, as a pathognomonic character of the pelvis in question, if it is nothing more than a pathological coincidence, happening in most cases, then I can only see in the oblique-oval pelvis the association of two of the three types, to which we have referred all the varieties of pelvic malformation; for, in considering it in a practical point of view, and laying aside its extraordinary anatomical peculiarities, it will exhibit, simultaneously, the compression of one of the antero-lateral walls, and the oblique prominence of the sacro-vertebral angle.

§ 5. MALFORMATIONS DEPENDENT UPON A PREVIOUS DEFORMITY IN ANOTHER PART OF THE SKELETON.

We have already alluded, in advance, to the influence that a malformation of the spinal column, or of the lower extremities, might have over the shape of the pelvis, and we now proceed to illustrate the mode of action in both cases.

A. *Deviation of the Vertebral Column.*—For a very long period all the deviations of the spinal column were attributed to the baneful influences of rachitis; but owing to the able researches of Bouvier, of Guerin, and many others, this opinion is no longer tenable, since it is now well ascertained that several other diseases may produce abnormal curvatures in this column; and this distinction is quite as important to the accoucheur as it is to the orthopedists, for it establishes at once a line of division between those deviations which nearly always coincide with an imperfect conformation of the pelvis, and those which often exist, even where the latter is well formed. The former are of a rachitic nature; but the latter are developed under the influence of some other affection. For instance, in sixty-nine cases of deformity in the vertebral column, described by M. Bouvier, the pelvis was in a normal condition, and the extremities were nearly all exempt from alteration in fifty-seven, and but twelve were accompanied by a malformation of this cavity, and by an incurvation of the limbs.

It must not be supposed, however, that the deviations of the spine which are not dependent on rickets, have no influence whatever over the direction and shape of the pelvis. It is only in subjects of advanced age, as a general rule, that curvatures of this column, happening after infancy, will ultimately determine changes in the form and direction of the pelvis; and, therefore, they have but little interest for the accoucheur.

As regards the curvatures produced by rickets, though they be not the essential cause of pelvic deformities, yet they do not the less exercise an unfavorable influence over the degree of contraction, and the irregularity in the shape of the pelvis; for the same action which gives rise to these deformities in old persons, also produces them, in a great measure, in rickety children. In either case, the pelvis yields under the influence of the spinal deviation; with this difference only, that what takes place slowly in the aged, is rapidly effected in the child, because in the latter the softening of the bones favors the action of the cause.

The principal alteration consists of an increase of the angle formed by the junction of the lumbar column with the base of the sacrum, which gives the pelvis a figure more or less similar to that described by Professor Nægèle, under the title of the *oblique-oval.*

B. *Congenital Luxations of the Femur.*—M. Sedillot, in a very interesting memoir on the congenital luxations of the femur, first called attention to the influence which these displacements might exercise on the conformation of the pelvis. The effects of this accident are manifested both in the greater and lesser pelvis, as may be seen from the following distances which he obtained in a case of double dislocation upwards and outwards, into the external iliac fossæ, by measuring the principal dimensions of the pelvis:—

1. From one anterior superior spinous process to the other,	8	inches.
2. From the middle of one iliac crest to the same point on the opposite side,	8½	"
3. From the middle of the iliac crest to the margin of the abdominal strait,	3⅛	"
4. From the middle of the iliac crest to the tuber-ischii,	6¼	"

Superior or Abdominal Strait.

5. Antero-posterior diameter,	4⅛ inches.
6. The same diameter taken from the pubis to the articulation of the first piece of the sacrum with the second,[1]	4½ "
7. Bis-iliac or transverse diameter,	4¼ "
8. Oblique diameter,	4⅛ "

Perineal Strait.

9. Coccy-pubic diameter,	3½ "
10. Transverse diameter,	5¼ "
11. Oblique diameter,	4¾ "
12. Summit of the pubic arch,	1½ "
13. Base of the arch (taken on a level with the inferior border of the oval foramen),	4⅛ "

Pelvic Excavation.

14. Depth of the posterior wall,	5 "
15. Depth of the anterior wall,	1⅛ "
16. Thickness of the pubic symphysis,	½ inch.
17. Depth of the sacral concavity,	1⅛ inches.
18. From the summit of one ischiatic tuberosity to the same point on the opposite side,	5¼ "

From these measurements it appears: 1st. That the transverse dimensions of the greater pelvis are considerably lessened by the vertical elevation of the iliac fossæ, which approximate each other to such an extent as only to leave an interval of eight and a half inches, whereas the normal distance is ten and a half inches. 2d. That the relations which exists, in the normal state, between the antero-posterior and transverse diameters of the superior strait is changed; since the transverse diameter is somewhat shorter here than the antero-posterior one; whereas, in the ordinary state, it is nearly an inch longer. 3d. That an inverse change takes place at the inferior strait, the bis-ischiatic diameter being five and a quarter inches, while the coccy-pubic one is but three and a half inches.

---

[1] The antero-posterior diameter is generally measured from the upper and internal part of the symphysis pubis to the superior border of the sacrum: but M. Sedillot very justly remarks, that in many of the pelves which are the seats of a double congenital luxation, the upper margin of the sacrum, in consequence of the great prominence of the sacro-vertebral angle, is found far above the pubis, and the articulation between the first two pieces of the sacrum is then on a level with the superior surface of this bone. Now, in such a case, the true antero-posterior diameter of the abdominal strait would extend from the upper border of the pubis to the part of the sacrum found on the same level, and this interval, therefore, is the only important measurement. But this observation is not new, as it had previously been made by Bland, and repeated by Merriman, in the following note: "Although the sacrum be carried so far forward that it seems to reduce the antero-posterior diameter at the entrance of the excavation to two or three inches, it is necessary in determining the degree of contraction to observe the difference in elevation between the sacro-vertebral angle and the upper part of the symphysis. The pubes being placed something lower than the greatest projection of the sacrum, and opposed to a part of that bone that is directed strongly backward, the real distance between them may be much more considerable than it may seem to be to the touch. Whence it happens that in cases where the projection of the sacrum has occasioned exceeding great difficulty in the beginning of the labor, opposing an almost insuperable bar to the entrance of the head of the child into the pelvis, by directing it too far forward over the pubes, yet when that direction has been altered by the use of instruments, or by any other means, and the head brought into the line of the centre of the pelvis, the conclusion of the labor has been frequently effected with very little exertion or force."—*Bland's Observations.*

These last modifications, says M. Sedillot, are easily explained, being the consequence of the natural position of the femurs in the external iliac fossæ; for individuals afflicted with a double luxation of this kind, walk with the legs wide apart, so as to bear and rest the heads of the thigh-bones against the sides of the ilia; though the effect would still be the same, even if their progression were not performed in this manner, because the external, lateral and superior surfaces of these bones, which usually incline outwards, will always be pressed upon to a certain extent, by the heads of the femurs, which have a tendency to straighten and carry them inwards. Whence the pelvis, from being thus compressed laterally, is elongated from behind forwards, and forms, in this latter direction, a more or less acute angle. The iliac fossæ, experiencing the pressure more directly, have yielded in a marked degree, though more at their middle than in front, because the head of the thigh-bone is thrown far back, and compresses the middle more than the anterior part of these fossæ. The ilium is often rendered more straight and nearly vertical, instead of being inclined outwards; and, should this phenomenon exist on both sides, it might interfere with the regular development of the womb; but if on one side only, it might occasion an obliquity of this organ in the opposite direction.

The anterior margin of the ilium also presents a singular disposition; for the conjoint tendon of the psoas magnus and iliacus internus muscles, which is inserted in the lesser trochanter, is then changed from its usual direction, and is carried upward by the ascent of the thigh-bone, and, as a consequence, this tendon deepens and changes the direction of its groove; whereby the anterior inferior spinous process is turned aside in a more or less sensible degree.

The shortening of the transverse diameter of the upper strait is evidently due to the lateral pressure made by the heads of the femurs almost perpendicular to this strait; and, as a flattening in the transverse direction is necessarily accompanied by an elongation antero-posteriorly, the sacra-pubic diameter is found augmented in a corresponding degree.

The examination of the inferior strait also exhibits a very curious phenomenon, just the reverse of what we have met with at the abdominal one; that is, there is a considerable increase in the extent of its transverse diameter, with a notable diminution in that of its coccy-pubic one. Here, also, the situation of the femurs must be referred to in explanation of the circumstance; for these latter are carried far upwards, outwards, and backwards, since their superior articular extremities have escaped up into the external iliac fossæ; and they keep the surrounding muscles constantly tense (more particularly the quadrati, the gemelli, and the internal obturator muscles, which run from the ischiatic tuberosities to the extremity of the thigh-bones), and thus drag the ischium outwards; the lower fibres of the obturator externus and the adductor muscles, and the internal part of the articular capsule, act in the same manner on the columns of the pubic arch, thereby producing a wide separation of the two ischia. The latter, in turn, draw on the greater and lesser sacro-sciatic ligaments, thereby creating a greater curvature in the inferior bones of the sacrum and coccyx, and consequently the diminution of the coccy-pubic diameter, as also a greater depth in the concavity of the sacrum. The want of depth in the pelvic excavation depends on the same cause; for, when the ischium is drawn towards the external iliac fossa, the lower part of the pubic arch is necessarily bent out, and, as a consequence, the depth of the pelvis anteriorly is diminished. (*Sedillot.*)

The weight of the body when erect, is the principal agent of this deformity; which essentially results, as just stated, from the tension exerted from within outwards on both sides by the capsular ligaments of the two deformed articulations, which hold the trunk suspended, as it were, between the thigh-bones; and the force exerted by these ligaments on the pelvis is equal in power to the tendency of the weight of the body to elongate them. Lastly, the contraction of the cotyloid cavity has some little influence over the change in extent, which the pelvis undergoes, though it explains but a very small part of the deformity. (*Bouvier.*)

[Dr. Lefeuvre (Paris, Thesis, 1862) very properly insists upon the changes produced in the inclination of the pelvis. The most constant effect, says this physician, of congenital luxations of the femur, is a deviation of the normal inclination of the pelvis. The position which the femurs occupy in the external iliac fossæ so alters the conditions upon which the stability of the body depends, that the pelvis, pressed from above by the weight of the parts above it and supported only from behind, becomes tilted forward. To this inclination of the pelvis is due the lumbar depression, which is increased still more by the posterior projection of the shoulders required for the maintenance of equilibrium. The normal inclination of the superior strait, which was estimated by Osiander at 30 degrees, and by Levret at 23 degrees, was studied very carefully by Nægèle, who brought it to 59 degrees. In congenital luxations the inclination may amount to 80 or 85 degrees, as is shown by the specimens, Nos. 739, 744, 763 C in Dupuytren's museum. It may even be still greater, become vertical, or even go beyond the perpendicular.

The inclination of the inferior strait is increased at the same time, though not always in the same proportions, on account of the variable depth of the cavity of the pelvis.

This forward inclination of the pelvis causes the anterior face of the sacrum to become inferior, and it may happen that the vertebral extremity shall be found lower than the coccygeal. The symphysis of the pubis becomes at the same time horizontal instead of vertical.

When the luxation is double, the inclination is nearly uniform on both sides, and the vertebral column presents an antero-posterior curvature. When the luxation is single, at the same time that the pelvis is inclined forward, a lateral inclination also takes place, due to the lowering of the luxated side on account of the want of support from the head of the femur. In this case the vertebral column will exhibit an antero-posterior curvature, with deviations toward the side of the luxation. (*Lefeuvre.*)]

The deformity is often irregular, or non-symmetrical, because the changes effected in the pelvis are more marked on one side than on the other; though, generally speaking, they are found to bear a relation to the degree of organization in the new joint; and if any accidental articular cavity exists, they are more developed on that side.

A pelvis, which has been referred to by M. Gerdy in his learned report, read before the Academy, on congenital luxations, and which presents some very singular modifications, may be seen at the *Musée Dupuytren;* it only has one femur attached, which is fused outside of the anterior inferior spinous process of the ilium on the left side. The anterior superior spine of the opposite coxal bone is two inches higher than the left one, and both bones are fixed with an equal degree of solidity in these relative situations; the sacrum, though very short, is quite broad, and the superior strait exhibits a modification similar to what has just been described; as to the inferior strait, it is very large in every direction, because the sacrum is exceedingly short, and the anterior pelvic wall is bent, as it were, forward and downward, on the same transverse and vertical plane, instead of being curved or bent downwards and backwards as in the normal state. (See No. 252, *Musée Dupuytren.*)

We have extracted from the memoir of M. Sedillot only those peculiarities that seemed important to be known, though we trust that enough has been given to prove that Dupuytren was greatly mistaken when he asserted that the phenomena of primitive luxations had no influence whatever over the development of the pelvis, and that the latter offered no greater obstacles to delivery than it does in well-formed persons; the incorrectness of which assertion is doubtless sufficiently proved by the details into which we have entered. However, it must be acknowledged that in such cases the delivery is seldom impossible, although it may be attended with some difficulties; at least, no instance has yet been recorded in which the expulsion of the fœtus could not take place without having recourse to a bloody operation on the mother or child, which is most certainly owing to the fact that, in congenital luxations, the contraction takes place in the longest diameters, both of the superior and inferior straits.

In a recent publication, M. Lenoir expresses an opinion so far contrary to that of M. Sedillot, as to suppose that double congenital luxations produce no notable alteration of the shape of the pelvis; and he mentions, in support of his view, the pelvis of a young woman, the dimensions of which he gives. These dimensions hardly differ from those of the normal pelvis, except as regards the inferior strait, where they present an increase in extent of rather less than half an inch.

The observations of M. Lenoir prove merely that the remarks of M. Sedillot are not applicable to all cases; still, the facts observed by the latter surgeon are of great value, showing as they do that congenital luxations may in some cases produce a marked change in the form and dimensions of the various parts of the pelvis.

M. Lenoir insists much more strongly than M. Sedillot upon the effect of simple congenital luxation. The latter is, he states, accompanied by an arrest in the development of all that side of the pelvis corresponding to the luxation, which atrophy produces so great a deformity of both straits and the excavation, that we may be certain, that although delivery is not always rendered impossible thereby, the labor will at least be longer and more difficult.

The latter proposition is, I think, by far too absolute, and facts are wanting to prove it. The deformity which follows simple luxation is much less than that resulting from a double displacement, and the specimen of M. Pacoud, described by M. Lenoir, seems to me in no wise to justify his assertions.

Is M. Lenoir more fortunate in his endeavor to trace a resemblance between a pelvis deformed in consequence of a simple luxation than the oblique oval pelvis of M. Nægèle? The points of difference between these two pelves are so numerous, that he has seemed to me to force whatever analogies may exist, by placing them in the same category. The anatomical characters do not justify it, and the prognosis especially is much less serious; finally, the indications to be fulfilled in both cases are essentially different.

C. *Non-congenital Luxations.*—The atrophy of the iliac bone corresponding to the dislocated femur may also be met with in luxations occurring after birth, whether the luxation be the result of an accident, or consecutive to an organic alteration of the articular surfaces, as in coxalgia. To produce this effect, all that is necessary is, that the luxation should remain unreduced, and that it should have occurred within the first years of existence. Now, as this atrophy was the cause of the deformities of the pelvis studied in the preceding paragraph, it may have the same consequences in the case under consideration. It is also plain that the pelvic deformity will be great in proportion as the luxation shall have occurred at a very early age.

[As M. Depaul observes (*Bulletin de la Société de Chirurgie*, année, 1865), the cause of these luxations ought also to be taken into serious consideration. When traumatic, it is much less likely to occasion deformity of the pelvis than when consecutive to disease of the bones. In the same paper are found two cases mentioned by M. Blot of unilateral luxation, caused by coxalgia in early childhood, giving rise to difficult labor. Cephalotripsy was necessary in the first case: the antero-posterior diameter measured three and a quarter inches; the right oblique diameter corresponding to the shortened member had its length notably diminished. In the second case, the antero-posterior diameter measured three inches, but as the patient was delivered prematurely, the fœtus was extracted with the forceps.]

D. *Lesions of the Inferior Extremities.*—The curvatures, so often met with in the lower limbs, do not always diminish their length in an equal degree; and this unequal shortening determines a variation in the pressure they make on the bottom of the cotyloid cavities; and, consequently, may affect the pelvis on the side where it is the greater. It is so true that the imperfect conformation of the pelvis is then dependent on a difference in the length of the lower extremities, that the latter may often be curved (provided they maintain the same length), without the pelvis being necessarily vitiated; and also, that where any inequality does exist between them, there is quite a constant relation between the deformed iliac bone and the longest limb. When a woman with deformed pelvis limps, she always does so on the sound and not on the diseased side, as one would be led to suppose at first thought.

It is further possible, that a shortening of one of the legs, whether resulting from a fracture, a luxation, or an atrophy of the limb, may produce the same result; more especially if these accidents take place in early childhood, when the pelvis is still far from having acquired its full development. Persons affected with chronic diseases of one of these limbs, and therefore under the necessity of walking with crutches, and of bearing the whole weight of the body on the sound leg, incur the same danger. Nevertheless, this latter circumstance has not always such an unfortunate influence; for Dr. Campbell mentions that he had an opportunity of examining the body of a woman who had made use of a crutch since the fourth year of her age, in consequence of a disease in her right lower extremity; this person, who died some time after delivery, had a perfectly formed pelvis. (*Campbell*, page 249.)

Amputation of the thigh, in a young girl, particularly in early childhood, is likewise capable of deforming the pelvis: thus, for example, Madame Lachapelle found the superior strait, in a female aged eighteen years, reduced to a moiety of its extent on the right side only, and pushed in totally towards the left thigh, which had been amputated four years previously. Indeed, we can readily imagine that, as the artificial limb only derives its point of support from the ischium, the acetabulum of the sound side will alone continue to be compressed by the weight of the body.[1]

ARTICLE III.

INFLUENCE OF DEFORMITIES OF THE PELVIS UPON PREGNANCY AND PARTURITION.

The deformities may certainly have an unfavorable influence over the progress of gestation; for, as we have already stated in the article on abortion, where the contraction of the straits accompanies an enlargement of the excavation, the womb, finding a more considerable space than usual in the cavity of the lesser pelvis, may become developed, and remain there beyond the ordinary period; and we have considered this circumstance as one of the causes of abortion, from the impossibility of its getting subsequently above the superior strait; and, when treating of retroversion, we remarked that this displacement was singularly favored by an increased depth in the concavity of the sacrum.

Even in cases of slight contraction of the superior strait, the sort of impaction which the uterus undergoes from the early stages of pregnancy, may produce a violent compression of the organs situated in the excavation. Van Dœveren mentions a very curious case, in which the patient experienced such acute pain in the hypogastric region from the third month of gestation as at first to excite fears of abortion. The symptoms continued, notwithstanding the use of the most rational means. By careful examination, he detected an oval tumor, painful to the touch, and extending above the umbilicus. The patient urinated frequently, though in but small quantity at a time. He suspected a dropsy of the uterus. The suffering continued in spite of all that could be done, and the patient grew worse and worse, until one morning when he found her much better and relieved of her excruciating pains. She no longer had fever nor difficult respiration, and the tumor had disappeared; the abdomen was flatter, softer, and presented an obscure fluctuation. He thought that the uterus had been ruptured, and, notwithstanding the contentment of the patient, gave the most unfavorable prognosis. She died, indeed, two days afterward. At the autopsy it was discovered that the greatly distended bladder had given way at its upper part. The uterus filled the lesser pelvis so completely as to leave no space between it and the walls of the pelvis. It compressed the vessels, the pelvic nerves, and the rectum, as also the urethra, against the pubis. The sacro-pubic diameter was but three inches and eight lines in extent.

---

[1] According to Campbell, the deformity of the pelvis may also be produced by contusions received on the dorsal region during childhood. I have, he says, met with several examples of the kind. A few years ago, I saw a patient who, when three years old, received a violent blow upon the lumbar region; the pelvis was in her case so deformed, that I thought it right to induce labor at the end of the seventh month. Although the pains were powerful, the head remained for seven hours in the excavation, but the child was nevertheless expelled. It lived eight days, and died in convulsions. Several fractures of the cranium were discovered at the autopsy, and several subcutaneous ecchymoses, caused evidently by the pressure to which the fœtus had been subjected during labor. (Campbell, *Introduction to the Study of Midwifery*, p. 248.)

This observation is too incomplete to justify the opinion of the author. Was the pelvis really contracted? Was not the woman rachitic? &c., &c.

When the transverse diameter of the greater pelvis is contracted by the straightening out of the iliac crest, as occurs in double congenital luxations of the femur, the development of the uterus is considerably impeded during the latter months of pregnancy; and this difficulty, according to Ant. Dubois, may prove a cause of premature labor. Where the straitening exists on one side only, the inconvenience is less; but still it may possibly contribute to the production of considerable uterine obliquity on the opposite side.

In general, however, with the exception of certain inconveniences, which evidently depend more on the extraordinary obliquity of the planes of the pelvis than on a diminution of its cavity, and to which we shall take occasion hereafter to revert, such contracted pelves rarely interrupt the course of gestation; but they have a far different influence upon the labor, to which we now ask the reader's attention more particularly.

The impediments to the delivery will usually be greater as the deformity of the pelvis is the more considerable; however, this proposition, although true in the majority of cases, is not absolutely so, since the degree of narrowing is not the only point that demands the accoucheur's attention; for the child's position, the size of its head, the flexibility of the cranial bones, the power of the uterine contractions, and the variable degree of relaxation of the pelvic articulations, are so many important circumstances which claim his consideration. One woman, perhaps, is happily delivered at term, whilst another, whose pelvis offers the same dimensions, will require the intervention of art for her relief. The same woman may be spontaneously delivered of her first child, and yet present such difficulties at the second labor that the mutilation of the fœtus may be deemed to be the only remedy for sparing her a bloody operation, without our thereby concluding that her pelvis had become contracted between these two pregnancies; for these differences might depend solely on the greater volume, or a less degree of reducibility of the head, or the bad position of her second child, &c. Most accoucheurs have observed facts of this nature, but we only present the following: A patient presented herself at the Clinique, in 1838, whose pelvis was only two and three-quarter inches in its sacro-pubic diameters; she was delivered in eighteen hours of a living infant, at term, the dimensions of which were nearly normal, and whose head was scarcely deformed. Baudelocque relates having seen, at the amphitheatre of Solayres, the head of a fœtus which was elongated to such an extent that its greatest diameter measured nearly eight and a half inches, whilst the bi-parietal one was reduced to two and three-eighths, or two and three-quarter inches; and he speaks of another very similar instance; but in neither of these cases was the child's life compromised for a single instant. M. Martin, of Lyons, has known a rachitic woman to be delivered of a healthy infant at term, by the efforts of nature alone; where the autopsical examination showed that the antero-posterior diameter was only two and a half inches in extent (page 270.) What rendered this case still more extraordinary was the existence of scirrhous tumors in the substance of the uterine walls. The reductibility of the head, therefore, is sometimes excessive, but unfortunately it is almost impossible to appreciate this in a positive manner beforehand.

To this source of uncertainty, says Madame Lachapelle, let us add that, in certain women, the degree of mobility of the symphyses does not permit a general separation of the bones (which, even if it existed, would scarcely enlarge the area of the strait or of its diameters); but rather a mutual gliding of the articular surfaces upon each other, an overriding of the pubes, so that one of the innominata advances to a range with the sacro-vertebral angle, whilst the other recedes to a greater or less extent. It follows from this mechanism that one of the oblique diameters at the superior strait, the one corresponding to the long diameter of the head, is notably increased; and the sacro-pubic one is also found augmented by the advancement of one of the coxal bones. Finally, continues this skilful midwife, it may be possible for both hip-bones to glide forward simultaneously, thereby enlarging still more the antero-posterior diameter.

In most cases of deformity, the child's position is far from being an indifferent matter; for when the sacrum, in being carried forward, is at the same time turned to one side, whereby one of the lateral portions of the pelvis is more contracted than the other, who does not foresee that the labor may then be accomplished spontaneously, if the head presents in such a way as to offer its great occipital extremity to the well-formed side; and that, on the contrary, it would become impossible, if the occiput should correspond to the contracted one?

Where the contraction is so limited that it might possibly permit a spontaneous delivery, any unfavorable position of the fœtus would greatly add to the existing difficulties caused by the malformation of the pelvis; if, for example, instead of presenting by the vertex, the child should offer its pelvic extremity, there would be reason to fear an arrest of the head above the superior strait, after the escape of the trunk; the slowness of its passage through this strait would not often warrant the abandonment of the delivery to the resources of nature, both from the dangers the infant incurs from a compression of the umbilical cord, and from the feebleness of the contractions of the womb, which, being almost entirely emptied and retracted, no longer retains its contractile properties. (See *Presentation by the Breech.*)

We need scarcely add, in conclusion, that a proper degree of energy in the uterine contractions bears so prominent a part in the accomplishment of labor that it cannot be overlooked. In certain cases, for instance, where the pelvis is so little contracted that the child's delivery is still possible by the application of the forceps, it is evident that frequent and strong contractions of the womb would render this instrument useless; again, the labor will terminate alone, in a case where the physician would have been obliged to interfere, if the pains had been too feeble or too slow.

We may conclude, therefore, that, in the question before us, there are a number of elements which may influence the result; and that, if the degree of narrowing of the pelvis is the most important point to be well ascertained, it is not the only circumstance upon which the obstetrician ought to base his determinations. For although the means of arriving at an exact knowledge of the extent of contraction are almost sure, yet, unfortunately, the same does not hold good with regard to the volume and the reducibility of the fœtal head, or the mobility and possible separation of the pelvic symphyses; and it is impossible to calculate in advance all the resources of the organism, or to know how far the uterine efforts will go. From our ignorance, on most of these points, arise the uncertainties and hesitations which so often prove fatal either to the mother or the child; uncertainties and hesitations that never influence persons that are not versed in all the difficulties of our art, but which are well understood by learned and experienced practitioners, who have frequently been under the painful necessity of making a decision and of determining a question whose solution might cost the lives of two individuals whom our mission is to save.

The foregoing reflections will, I hope, be sufficient to show that what we are about to say concerning the influence of the pelvic deformities upon the labor is not positive and absolute, but is only applicable to the majority of cases.

Under the head of the difficulties and indications presented by these deformities, we shall admit, with M. P. Dubois, three principal divisions. The first is composed of pelves in which the contraction, in whatever part it may exist, still leaves at that part an opening of at least three and three quarter inches in all its diameters; the second comprises those in which the contraction leaves, at the point of the canal it occupies, a passage, one or more of whose diameters will be three and three-quarter inches as a maximum, and two and a half inches as the minimum; and, lastly, we shall include in the third all the cases where the narrowing is such, that the dimensions of the resulting space will be under two and a half inches.

A. *Of the Pelvis having at least three and three-quarter inches in its Contracted Part.*—Here the labor, although in general longer, more difficult, and therefore more dangerous, both for the mother and child, than in ordinary cases, may, however, be accomplished spontaneously; and, indeed, we might hope for such an expulsion in most cases. The slowness of the labor is observable in the dilatation of the os uteri, as well as in the expulsive stage; for, during the first stage, the uterine contractions, though energetic and often regular, have but little action on the dilatation of the cervix; the head is high up, and has no tendency to engage in the excavation, and it remains above the symphysis pubis, against which it is strongly applied, being thrown forwards by the prominence of the sacro-vertebral angle. Indeed, it is highly probable that the extreme slowness of the dilatation is attributable to this latter circumstance; for the lower front part of the womb is so compressed between the child's head and the pubic symphysis, that the longitudinal fibres of the body can scarcely act at all on the circular ones of the cervix, notwithstanding the energy of their contractions; for we often find, after the size of the head has been diminished by a perforation of the cranium, whereby this compression is relieved, at least in a great measure, that the dilatation that was hitherto stationary now progresses very rapidly.

As to the modifications that take place in the period of expulsion, they vary according to the seat of the contraction; for instance, when the superior strait is the place of the deformity, the engagement of the head might be so much retarded that it could only succeed in clearing this obstacle under the influence of the most powerful contractions; though, should these be sustained, the labor would terminate happily. But if, as is sometimes observed, the corresponding diameter of the inferior strait is simultaneously enlarged, the child's head, after having surmounted the difficulties offered at the upper one, will not find a sufficient degree of resistance at the perineal strait to moderate the rapidity of its descent; and, consequently, it might strike violently against, and lacerate the perineum; the disastrous consequences of which are well known.

Where the superior strait retains its normal dimensions, the inferior one alone being contracted, the head descends rapidly enough into the excavation, but it can only clear the last parts of the canal with the greatest difficulty; for, as the dimensions of the lower strait are in general somewhat smaller than those of the upper, it follows that the same degree of contraction here is much more unfavorable to the delivery, and oftener requires the application of the forceps.

Finally, where the two straits are contracted in the same degree, all the causes of difficulty just mentioned are found conjoined. Most frequently, the head succeeds in passing the superior strait; but, having reached the excavation, and being unable to advance any further, it there remains wedged in until the exhausted or enfeebled forces are sufficiently renovated to effect its delivery. During all this time, the head, which had been forcibly compressed in order to clear the upper strait, and had its dimensions reduced by the overlapping of the parietal bones, gradually regains its natural size, now that it has entered a larger space, departing also from the conical shape it had acquired in the first stage, as its delay there is the more prolonged, and, consequently, meeting with new obstructions at the inferior strait, which are so much the more difficult to overcome as the uterine forces are already the more exhausted.

These differences in the seat of the contraction ought to be known, for they will enable the accoucheur to avoid an error in diagnosis which otherwise he might very readily commit; for example, in the cases where the superior strait alone is contracted, the head gets into the excavation only after very long-continued pains, but then it clears the inferior one almost immediately afterwards; whereas the contrary happens when this latter is the only one contracted, and the attending physician, judging of the future by the past duration of the labor, announces that it will terminate sooner or later, according as the head has descended more or less rapidly into the excavation; but he will almost always deceive himself; because in the former instance, the termination will be very rapid, though he believed it still distant; and, in the latter, it will be delayed far beyond the time that he had fixed.

B. *Where the Pelvis has at least two and a half inches in its Contracted Part.*—A spontaneous expulsion of the fœtus is still barely possible, where there are from three and one-eighth to three and three-quarter inches in the contracted part; though, in reflecting on the length of the head's smallest diameter, which at term is at least three and one-half inches, it must be evident that, in order to render the delivery practicable under such circumstances, the diameters of the cranial vault should present a great reducibility, and the contractions of the womb be strong and prolonged. But in an immense majority of the cases under three and one-eighth inches, the resources of art become indispensable, unless the child's parts should be softened by putrefaction, or the infant itself not have acquired the development it usually exhibits at the ordinary term of gestation.

C. *Where the Contracted Diameter is less than two and a half inches.*—This degree of contraction renders a natural labor at term physically impossible; because too great a disproportion exists between the dimensions of the canal and those of the body which has to traverse it; and no other alternative remains for the accoucheur than to augment the former by symphyseotomy, or to diminish the latter by embryotomy; unless, indeed, he should rather prefer to open for it a new and more easy route by practising the Cæsarean operation.

M. Depaul, it is true, mentions in his lectures two cases, in which delivery was safely accomplished although the pelvis had only two and a quarter inches in its antero-posterior diameter. They are, however, such rare exceptions that they might be forgotten, so to speak, in ordinary practice. Safe delivery ought not to be counted on with a diameter less than two and five-eighths inches.

As regards the prognosis, it is very important to distinguish a pelvis deformed by rachitis from one whose contraction is dependent on mollities ossium; for although, in the former case, the gravity of the prognosis is equal in proportion to the degree of contraction, yet it is not exactly or always in the latter. Here, indeed, arises the important consideration that the first effect of malacosteon is to produce an excessive softening of the osseous tissue, the deformity of the skeleton being consecutive thereto: but softening only reaches its *summum* of intensity by degrees, and the disease may be arrested in its progress, may be ameliorated, or even entirely cured under the influence of a proper treatment. Whence it is evident that during the period of increase and that of its amelioration, which may extend over several years, the softening passes successively through different degrees, and where it happens to exist at the time of labor, furnishes the practitioner a very valuable resource, whatever may be the degree of contraction. In fact, it would appear, from the cases reported in the dissertation of M. Spengel, that the bones often retain, at the time of labor, a sufficient degree of suppleness to enable them to dilate spontaneously, and to allow the expulsion of the fœtus, or, at least, its artificial extraction. Thus, in a case furnished by Homberger, the sacro-pubic diameter was scarcely two inches in length; nevertheless, after having ascertained the flexibility of the bones caused by the malacosteon, he declared that the delivery might be effected by the powers of nature. He ruptured the membranes at the end of twenty-four hours; then, after waiting as much longer; the engagement was sufficiently advanced to enable him to apply the forceps; when, by the aid of powerful tractions, he succeeded in bringing away a girl who lived four weeks. In another woman, whose sacro-pubic diameter was two and a quarter inches (French measurement) at the most, Hasslocher, a physician of Landau, was enabled, by the aid of external pressure, to make the child's head engage in the cavity of the pelvis; he then applied the forceps, and found that only a moderate effort was required to deliver a dead child weighing six pounds and a half.

Kilian mentions other cases of safe delivery during pregnancy, and Dr. Collineau witnessed another, an account of which will be found in his excellent thesis.

Facts of this nature are certainly consolatory, and they well merit attention; but, unfortunately, it is a very difficult matter to recognize that precise degree of flexibility in the bones, under which there is no reason to hope for a spontaneous dilatation; for, between the first stages of softening in them and that advanced period when they scarcely have the consistence of a gelatinous pulp, there are numerous intermediate degrees; and the great difficulty consists in determining the cases in which we can trust to the efforts of nature, and those in which nothing can be hoped from this source. A misplaced confidence might be attended with the most serious consequences; for, on the one hand, a prolonged delay may compromise the child's life, that might have otherwise been saved, by resortin to the Cæsarean operation at the most favorable moment; and on the other, the tentatives uselessly made with the forceps expose the mother to the greatest dangers; for bones affected by this disease are, it is true, most generally softened, but sometimes it happens that the affection has only rendered them more friable, and, of course, any tractions made by the instrument, in such cases, might give rise to dangerous fractures. It would, therefore, be highly desirable to have a rule of procedure, but in the present state of our science it is impossible to lay down any positive one; and the accoucheur must found his opinion on the whole of the phenomena exhibited in the particular case. "Without supposing," says M. Spengel, "that it will be possible to ascertain, positively, to what extent the softening of the pelvic bones has advanced, we believe that, by paying attention to the symptoms which preceded and those that accompany the labor, it may be determined in quite a probable manner. We have collected forty cases of general mollities ossium that occurred in females; in nineteen of which the time when the pains first began is not noted, and no conclusions therefore can be drawn from them; but, in twelve cases, the first pains appeared during the lying-in, in two others, shortly after the accouchement, and in the remaining seven, during the course of gestation; and, whenever the period has been carefully noted when the pains, after having been once calmed, were aggravated anew, it has been found that this exacerbation came on during a new pregnancy. Whence we may suppose that the softening of the bones is more considerable towards the end of gestation than it was before its commencement. Therefore, when the alteration progressively increases until term, and the difficulty in the patient's movements or the pains exhibit no diminution, we believe the degree of softening may be regarded as bearing a relation to the violence and duration of these symptoms. Further, by resorting to the manual exploration, we are enabled to detect in some cases a softening to such an extent that the bones yield to the pressure of the fingers. Under such circumstances the accoucheur may doubtless rely on a spontaneous delivery, or at least on the success of a prudent application of the forceps; which latter should then be made rather than resort to the Cæsarean operation, which is so grave at all times, but is still more so when practised on women affected with malacosteon."

Independently of the difficulties which the contractions of the pelvis give rise to in the accomplishment of the mechanical phenomena of labor, they often become the source of serious accidents to the mother, and subject the fœtus to the greatest dangers. For, by forming an invincible obstacle to the passage of the head, they expose the woman to a rupture of the womb or bladder, to a violent contusion, and the consecutive inflammation of those organs and of the peritoneum, and, lastly, to a febrile or adynamic state, which is serious enough of itself to cause her death before the delivery is effected; since this condition is the most frequent source of mortality in those patients who are not relieved. Again, even where the delivery has taken place either spontaneously or artificially through the natural passages, the duration of the preceding travail and the pressure of the child's head upon all the soft parts lining the straits and excavation, expose these latter to prolonged contusions, which are most frequently followed by gangrene; whence we have following in their train utero-vesical, or vesico-vaginal fistulas, etc., etc., according to the point that has been more particularly compressed. The forced engagement of the head in a contracted pelvis often determines the separation of the symphysis, from which inflammations and suppurations, that are often very tedious in their cure, result as the immediate consequences, and a great mobility of the pelvic articulations, limping, and sometimes even an inability to walk or stand, as the remote ones. (*Lachapelle.*)

As regards the child, the slowness of the labor may evidently occasion its death; for, in the case before us, the head being retained above the superior strait does not prevent the discharge of the amniotic liquid by plugging up the os uteri, and this nearly all escapes; consequently, the fœtus is subjected soon after the membranes give way to the direct pressure of the contracted uterine walls during all the time necessary to the termination of the labor.

The cord also is very frequently compressed, either in the uterine cavity, between its parietes and the body of the child, or subsequently in the excavation into which it may have slipped; the descent of the cord is here singularly favored by the elevation of the head. This latter itself, having to support all the pressure from the resistance offered by the pelvis, is exposed to very unequal compressions, which may fracture the cranial bones or wound the cerebral matter. Lastly, when the fœtus presents by the pelvic extremity, the violent tractions sometimes made on the trunk, for the purpose of disengaging the head, may produce luxation or fracture of the cervical vertebræ or stretching of the spinal marrow, both of which speedily prove fatal.

ARTICLE IV.

DIAGNOSIS OF PELVIC DEFORMITIES.

The circumstances whereby the existence of a deformity of the pelvis may be recognized, have been divided into the *rational* and the *sensible* signs. The first include all those that may be learned from the previous history, and a general examination of the individual—her constitution, height, and physical strength; and the second, on the contrary, are deduced from an external and an internal examination of the pelvis.

§ 1. Rational Signs.

The accoucheur who may be called upon to decide on the good or imperfect conformation of a female, should, before proceeding to an exploration of the pelvis, inform himself minutely of all the antecedent circumstances which might throw any light on his diagnosis, or direct his subsequent researches. He ought to ascertain from the near relatives, all the accidents which the young girl submitted to his care may have met with in infancy: at what age she began to walk; whether standing in the erect position was easy, or even possible, in the early years of life; or whether, after having walked without any marked difficulty, she was subsequently afflicted with a weakness in her lower extremities; and, should there be an existing curvature of the spine or limbs, the period at which such incurvations appeared is to be carefully ascertained; as, also, whether those in the lower extremities preceded or followed that of the spine. Where any limping is observed, he will endeavor to verify the information derived from the family, by examining whether this depends on a difference in the deformity of the two limbs; on the atrophy of one of them; on the flattening of the antero-lateral pelvic walls; on an old or a recent affection of the femoro-coxal articulation; on a spontaneous or a congenital luxation, followed by the permanent displacement of the head of the femur; or whether upon an old and imperfectly consolidated fracture;—because the answer to all these questions will render the examination, which is afterwards to be resorted to, much easier.

[A first general glance will, in the majority of cases, render it possible to establish a differential diagnosis in respect to the two most frequent causes of deformity of the skeleton, in rachitis and flexures of the vertebral column by scoliosis, cyphosis, or lordosis.

In a rachitic skeleton, the diminished stature of the individual is due, on the one hand, to arrested development of the bones, and on the other, to their curvature, which is more especially observed in the lower extremities. Hence it results that the skeleton of a rachitic woman has special characteristics. Owing to the curvature of the lower extremities, the pelvis descends with them, and occupies a lower level than it would in the normal condition, and is contracted besides. The vertebral column, though less deformed, appears long in comparison with the inferior extremities. The arms are short, though less on account of their curvature than in consequence of arrested development. We shall see hereafter that the deformities in cases of spinal distentions are of an entirely different character.

FIG. 99.

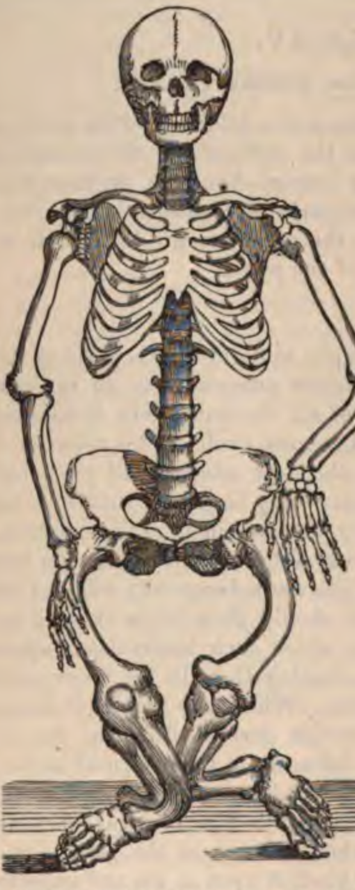


FIG. 100.

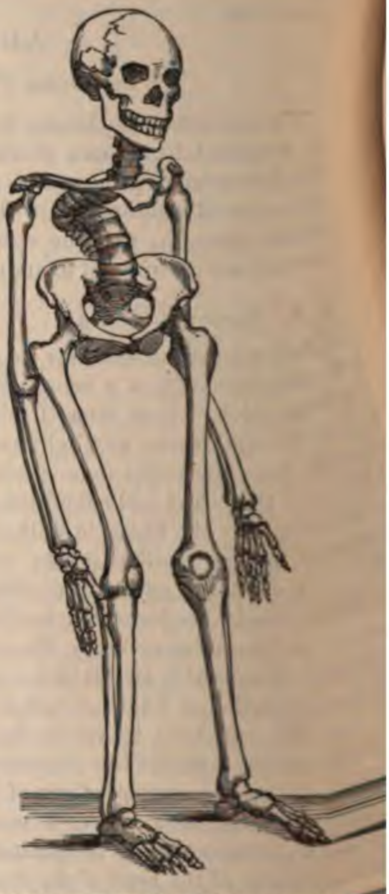


FIG. 99. Skeleton deformed by rachitis. The low stature is due to curvature of the inferior extremities. The pelvis is deformed. Drawn from nature.

FIG. 100. Skeleton deformed in consequence of flexure of the vertebral column. The low stature is due to curvature of the spine. The lower extremities are normal; they look very long. The pelvis is well formed. Drawn from nature.

When deformity of the skeleton is due to curvature of the vertebral column occurring at the age of puberty, the stature of the individual may be greatly lessened, but then the result is due almost entirely to the affection of the spine, the lower limbs preserving their usual length and direction. The well-formed pelvis is at the same elevation as in a normal skeleton. The vertebral column, on the contrary, is folded, as it were, upon itself. The upper extremities are well formed, but lowered with the upper part of the body, often causing the hands to reach to the lower part of the thighs, or even to the knees.

It is very important not to confound rachitic deformity with distortion of the spinal column by scoliosis, cyphosis, or lordosis. Delivery, in the first case, is often difficult or impossible; in the second, on the contrary, it is almost always easy. (See figures 99 and 100.)]

The history of the earlier years of life is particularly important, as it will not only enable us to divine the perfect or defective conformation of the pelvis with a tolerable degree of certainty, but will even serve to enlighten us as to the nature of the general affection that has produced the deformity. In fact, it would appear from the researches of modern pathologists that rachitis, properly so called, is a disease of childhood, though it is seldom observed in the infant at term; it generally begins about the eighteenth or twentieth month, and is rarely found after the age of puberty. Thus, in three hundred and forty-six cases, examined in this respect by M. Jules Guerin, its invasion took place as follows: in three cases, before birth; in ninety-eight, during the course of the first year; in one hundred and seventy-six, during the second; in thirty-five, in the third; in nineteen, in the fourth; in fifty, in the fifth; and in five children from the sixth to the twelfth year of life.

From these and numerous other cases reported by Bouvier, Ruff, &c., it is apparent that deformities occurring in infancy are nearly always of a rickety nature; whilst all the varieties of softening that take place in adult bones, as also all the disfigurations occurring exclusively in young girls about the period of puberty, are not caused by this disease. (*Guerin.*)

A rachitic origin of the deformity can, therefore, be almost constantly relied on where the disease that determined the latter existed during the early years of life; and this suspicion will be confirmed, if it should appear, conformably to the law laid down by the orthopedists, and stated formally by M. Guerin, that the malformation proceeded from below upwards, and that the tibias, the femurs, and the spinal column were successively affected.

On the other hand, should the first ten years of life pass away without accident, and the deformity of the skeleton occur only at puberty, it would be wrong to attribute it to rachitis, and the pelvis will probably be unaffected.

If, however, the deformity occurs during adult age, especially if the patient has been safely delivered before, and has since that time had all the symptoms of acute softening, the entire difficulty should be attributed to osteomalacia.

After attending to all these points, the accoucheur might proceed to a more careful inspection of the individual; and the vertebral column and lower extremities should particularly claim his attention. He ought to bear in mind that rachitic deviations of the spine (and, when dating from early infancy, they will be nearly always rachitic) are almost constantly accompanied by deformity of the pelvis; and that, on the contrary, the other varieties, more especially when they first occurred about the age of hand, to arrested development of the bones, and on the other, to their curvature, which is more especially observed in the lower extremities. Hence it results that the skeleton of a rachitic woman has special characteristics. Owing to the curvature of the lower extremities, the pelvis descends with them, and occupies a lower level than it would in the normal condition, and is contracted besides. The vertebral column, though less deformed, appears long in comparison with the inferior extremities. The arms are short, though less on account of their curvature than in consequence of arrested development. We shall see hereafter that the deformities in cases of spinal distentions are of an entirely different character.

Fig. 99.

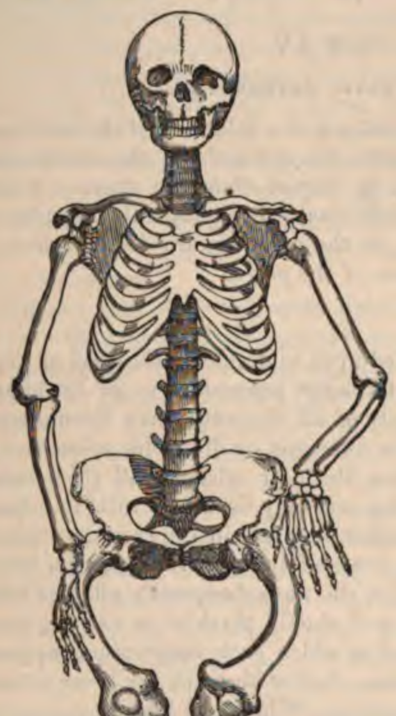


Fig. 100.

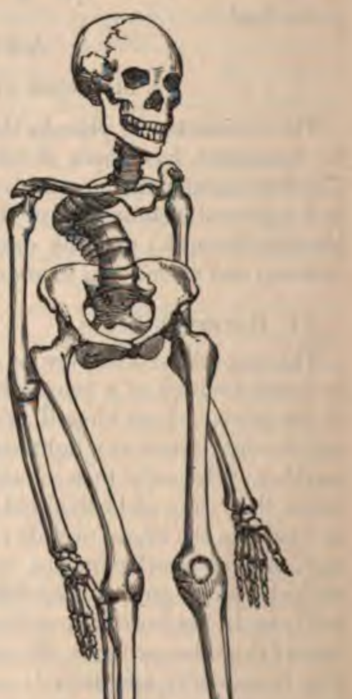


Fig. 99. Skeleton deformed by rachitis. The low stature is due to curvature of the inferior extremities. The pelvis is deformed. Drawn from nature.

Fig. 100. Skeleton deformed in consequence of flexure of the vertebral column. The low stature is due to curvature of the spine. The lower extremities are normal; they look very long. The pelvis is well formed. Drawn from nature.

When deformity of the skeleton is due to curvature of the vertebral column, occurring at the age of puberty, the stature of the individual may be greatly lessened, but then the result is due almost entirely to the affection of the spine, the lower limbs preserving their usual length and direction. The well-formed pelvis is at the same elevation as in a normal skeleton. The vertebral column, on the contrary, is folded, as it were, upon itself. The upper extremities are well formed, but lowered with the upper part of the body, often causing the hands to reach to the lower part of the thighs, or even to the knees.

It is very important not to confound rachitic deformity with distortion of the spinal column by scoliosis, cyphosis, or lordosis. Delivery, in the first case, is often difficult or impossible; in the second, on the contrary, it is almost always easy. (See figures 99 and 100.)]

The history of the earlier years of life is particularly important, as it will not only enable us to divine the perfect or defective conformation of the pelvis with a tolerable degree of certainty, but will even serve to enlighten us as to the nature of the general affection that has produced the deformity. In fact, it would appear from the researches of modern pathologists that rachitis, properly so called, is a disease of childhood, though it is seldom observed in the infant at term; it generally begins about the eighteenth or twentieth month, and is rarely found after the age of puberty. Thus, in three hundred and forty-six cases, examined in this respect by M. Jules Guerin, its invasion took place as follows: in three cases, before birth; in ninety-eight, during the course of the first year; in one hundred and seventy-six, during the second; in thirty-five, in the third; in nineteen, in the fourth; in fifty, in the fifth; and in five children from the sixth to the twelfth year of life.

From these and numerous other cases reported by Bouvier, Ruff, &c., it is apparent that deformities occurring in infancy are nearly always of a rickety nature; whilst all the varieties of softening that take place in adult bones, as also all the disfigurations occurring exclusively in young girls about the period of puberty, are not caused by this disease. (*Guerin.*)

A rachitic origin of the deformity can, therefore, be almost constantly relied on where the disease that determined the latter existed during the early years of life; and this suspicion will be confirmed, if it should appear, conformably to the law laid down by the orthopedists, and stated formally by M. Guerin, that the malformation proceeded from below upwards, and that the tibias, the femurs, and the spinal column were successively affected.

On the other hand, should the first ten years of life pass away without accident, and the deformity of the skeleton occur only at puberty, it would be wrong to attribute it to rachitis, and the pelvis will probably be unaffected.

If, however, the deformity occurs during adult age, especially if the patient has been safely delivered before, and has since that time had all the symptoms of acute softening, the entire difficulty should be attributed to osteomalacia.

After attending to all these points, the accoucheur might proceed to a more careful inspection of the individual; and the vertebral column and lower extremities should particularly claim his attention. He ought to bear in mind that rachitic deviations of the spine (and, when dating from early infancy, they will be nearly always rachitic) are almost constantly accompanied by deformity of the pelvis; and that, on the contrary, the other varieties, more especially when they first occurred about the age of puberty, do not affect the normal regularity of the pelvis. It is also to be remembered that rickets may possibly give rise to curvature of the lower extremities without altering the pelvis, though these two parts of the skeleton are most generally affected at the same time.

In a few rare cases, rachitis affects but one lower extremity, the other retaining its normal proportions, and yet the pelvis may be deformed.

An attempt has been made to establish a certain relation between the direction of the curvature of the spine or lower extremities, and the particular species of malformation the pelvis may exhibit. For instance, the sacrum, being an assemblage of vertebræ, which are naturally consolidated together, is occasionally modified by incurvations that are continuous with those of the spine, and these are further kept up by the coccyx. Sometimes the lateral inflexion of these two bones is continuous with the lumbar curve; though, more frequently, they describe an inverse curvature with one or two of the last lumbar vertebræ, and the point of the coccyx is then turned aside. According to M. Hohl, the lateral inflexion of the lumbar column often determines a greater contraction of the pelvis on the side towards which these vertebræ lean.

Agreeably to the same author, the curvature of the femurs occasions a transverse contraction of the pelvis, and a consequent elongation antero-posteriorly, when these bones are curved forward; whilst their outward curvature is followed by a transverse enlargement; but if one bends outward and the other forward, a corresponding shortening will thence result in the latter direction. However, all these approximations must be substantiated by a more extended experience to render them deserving of confidence, although it would be improper in practice to neglect them altogether.

The relations that M. Weber has endeavored to establish between the dimensions of the cranium and those of the pelvis are not constant enough to merit any consideration whatever in an examination which requires so much precision.

Quite recently, M. Guerin, after having ascertained that rachitis proceeds from below upwards, and that the reduction in the dimensions of the bones follows the same progression, attempts to prove further that the dimensions of a rickety bone being known, the size of other parts of the skeleton may be approximately determined; and that the reduction in the three diameters of the pelvis in rachitic women follows the diminution in the size of its component parts; also that the degree of this reduction is intermediate to what takes place in the femur and in the humerus.

These results, so valuable in themselves, had they been deduced from a large number of cases, are, unfortunately, based upon a very limited observation; and, consequently, have not all the weight that I hope they will hereafter acquire; for the great importance of being able to determine, with certainty, from the degree of shortening of the femur and humerus, not only that the pelvis is deformed, but even the extent of the malformation must be self-evident.

In conclusion, it is apparent that the rational signs just spoken of can only give us probabilities or approximations. Now, the indications presented by the deformities of the pelvis demand an exact and a rigorous solution of all the questions of diagnosis appertaining thereto; because it is not on a mere probability that an accoucheur can venture to prohibit a young girl from marriage, or decide on the performance of an operation that mutilates the child, or exposes the mother to the most serious dangers. Such a decision can only be made after a thorough and minute examination of the external form, and the internal dimensions of the pelvis; and this examination alone can enable him to detect those sensible signs which afford a positive certainty.

§ 2. SENSIBLE SIGNS.

The accoucheur should not content himself, therefore, with the foregoing characters, but he ought to seek, in the mensuration of the pelvis, for the elements necessary to his diagnosis. This process is performed both on the exterior and interior of the pelvis; in the former case it constitutes what obstetricians have termed *external*, and in the latter, *internal pelvimetry*.

When we described the pelvis, in the early part of the work, we only pointed out the dimensions that were absolutely necessary to the full comprehension of the mechanism of natural labor; but we must now supply that voluntary omission; for, in addition to the distances then given, there are several others which are indispensable to the practice of pelvic mensuration; and we give the following as the average of a well-formed pelvis, viz.:

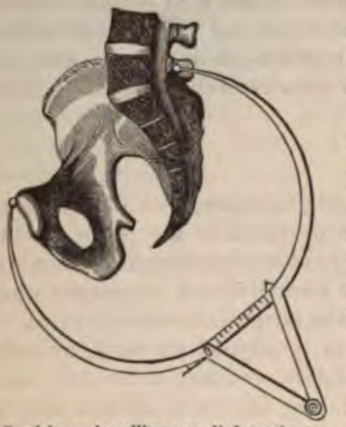
1. From the anterior inferior spinous process of one ilium to the same point on the opposite side, ...	8½	inches.
2. From the anterior superior spinous process of one side to the same point on the other, ...	9½	"
3. From the middle of the iliac crest of one side to the same point opposite, ...	10½	"
4. From the middle of the iliac crest to the tuber ischii, . .	7½	"
The superior strait divides this distance into two equal parts, whence the lateral portions of the greater or lesser pelvis are each	3¾	"
5. From the anterior superior part of the symphysis pubis to the apex of the first spinous process of the sacrum, ...	7½	"
From which 2½ inches are to be deducted for the thickness of the base of the sacrum, and ½ an inch for that of the symphysis; therefore leaving for the sacro-pubic interval . . .	4½	"
6. From the tuber ischii of one side to the posterior superior spinous process of the opposite ilium, the mean extent, in an ordinary pelvis, is	7	"
7. From the anterior superior spine on one side to the posterior superior spine of the other, the mean is	8¼	"
8. From the spinous process of the last lumbar vertebra to the anterior superior iliac side of either spine, the mean is . .	7	"
9. From the trochanter major of one side to the posterior superior spinous process of the opposite one, ...	9	"
10.[1] From the middle of the lower border of the symphysis pubis to the posterior superior spinous process on either side, . .	6¾	"

---

[1] The last five measurements are taken from the Memoirs of M. Nægèle, translated by M. Danyau. We shall hereafter revert to their importance [illegible] with the diagnosis of the oblique-oval pelvis.

For the purpose of ascertaining the dimensions just given, in the living female, as well as the principal modifications they may have undergone, accoucheurs have invented a great number of instruments, to which the title of *pelvimeters* has been applied; but I can only allude here to those in most common use.

Fig. 101.



Baudelocque's callipers applied to the measurement of the antero-posterior diameter of the superior strait.

The pelvimeter, or callipers, described by Baudelocque (Fig. 101), consists of two metallic blades bent in a semicircular form, so as to embrace the largest part of the pelvis in their concavity. The extremity of each one is terminated by a lenticular button, which is intended to be applied at the end of the line to be measured; a small rule, marked by a graduated scale, traverses the branches just at the point where the curved blade joins the straight handle, and shows the degree of separation at the points exactly. This rule shuts up in a deep groove along the handle of the callipers. The instrument is applied externally, and may prove very useful in estimating the measurements above given.

In skilful hands, the pelvimeter of Baudelocque may furnish very satisfactory results; but it must be acknowledged that it is far from affording the degree of certainty which its inventor anticipated, even in the determination of the antero-posterior diameter of the superior strait, the one, of all the pelvic diameters, which seems the best adapted to this mode of exploration; for, although one of the buttons can readily be applied at the upper front part of the pubic symphysis, after having carefully pushed aside the soft parts, yet it is far otherwise with regard to placing the other one just over the point corresponding to the spinous process of the first piece of the sacrum.[1] The difficulty of determining this latter point exactly, and the thickness of the soft parts, render this mode of mensuration very uncertain in its results. But, even supposing the instrument could be properly adjusted, the results thereby obtained would be scarcely more conclusive. When the pelvis is well formed, there should be, it is said, seven and a half inches between those two points; from which two and a half inches for the thickness of the sacrum at its base, and half an inch for that of the symphysis pubis, are to be deducted. But, the question at once arises, are the pelvic bones always uniform in thickness? or must we still deduct three inches for the substance of the bones, in cases of rachitis, where the skeleton exhibits a more or less marked arrest in its development? How are we to know to what extent this influence of rachitis over the growth of the osseous system is carried? And may not the thickness of the sacrum at its base, instead of exhibiting the normal average of three inches, be reduced to two, one and a half, or even one inch?[1]

---

[1] I have repeatedly made such attempts, and have so rarely succeeded in adjusting the point of the callipers over the spot behind where it is directed to be applied, that I have rather attributed those cases to chance, in which the touch did not set aside my first diagnosis; and I will add, further, that I have often known M. P. Dubois to abandon this mode of exploration after frequent ineffectual trials, and to rely wholly upon the vaginal examination.

If such sources of uncertainty exist in respect to the measurement of the sacro-pubic diameter, what must it be with regard to determining the transverse or oblique ones by the pelvimeter? For, is the interval between the anterior iliac spines always the same? In the normal state, that extending from the middle of the iliac crest on one side to the same point opposite is ten and a half inches, just double the length of the transverse diameter of the superior strait; but it is well known the iliac fossæ may vary in their concavity, and that the crests may approach more or less closely towards a vertical or a horizontal direction, without altering the form of the abdominal strait. Therefore, the supposed relations between these two distances exhibit such frequent anomalies that we cannot place any confidence in the conclusions endeavored to be established therefrom.

Again, where one point of the callipers is placed on the external surface of the trochanter major, and the other on the salient part of the opposite sacro-iliac articulation, with a view of determining the oblique diameters, no account is made of the numerous variations in the length and inclination of the cervix femoris, in the depth of the cotyloid cavity, or in the thickness of the soft parts behind.

Consequently, the employment of Baudelocque's pelvimeter can only give approximate results; but it is not the less a useful instrument in those cases where it would be impossible to introduce a foreign body into the vaginal cavity; for instance, the internal exploration is not permissible in young girls, and then we must resort to the use of the callipers. Fortunately, at such times, the diagnosis need not be very precise, and a few lines more or less cannot affect the decision of the physician.

[1] We have had opportunities of measuring a great number of pelves that were deformed in various ways and in different degrees, says Madame Boivin, in which the thickness of the walls in question departed from the three inches assigned to them by Baudelocque, to the extent of a third of an inch to an inch each, either larger or smaller. This difference in thickness was sometimes observed in the pubis, at others in the base of the sacrum, and again in both of these bones at the same time. Besides, in more than a hundred well-formed pelves, covered by all their tissues, which had not been altered by disease in any way, we have noticed considerable variations both in the volume and the thickness of the parts forming the antero-posterior diameter at the superior strait.

Madame Lachapelle has found the sacrum alone nearly three inches thick, in many well-formed pelves, whilst in some deformed ones it scarcely measured two inches.

"I consider the results," adds this skilful midwife, "that are obtained in measuring the transverse and oblique diameters of the strait, by taking certain portions of the iliac crests, the great trochanters, the ischial tuberosities, &c., for the points of departure, as very fallacious: Because, 1. In the best-formed women, the iliac crests are sometimes inclined towards each other, and at others are turned outwards, so that both an everted and a cylindroid variety may exist in natural pelves; 2. The great trochanters are more or less separated, according to t[illegible]riable direction and length of the neck of the femur, &c."

But the case is far different when the woman is pregnant or in labor, for then it is necessary to learn the dimensions of the pelvic cavity with the greatest exactitude. For this purpose, accoucheurs have devised various instruments, which they have designated by the title of *internal pelvimeters.*

The most ancient of all is the one invented by Coutouly, which closely resembles, in its general appearance, the instrument used by shoemakers, some years since, for taking the measure of the foot; it is composed of two iron rules, which slide on each other, and each having a short plate fixed at a right angle on one of its extremities. When it is introduced into the vagina, the two rules are slipped along each other, so as to get one of the plates against the sacro-vertebral angle, and the other just behind the posterior face of the symphysis pubis. One of these rules is marked by a scale, which indicates the degree of separation of the two plates, and, consequently, the length of the sacro-pubic diameter.

The use of this instrument is attended with such numerous inconveniences as to have banished it almost entirely from practice. Its application is difficult; it distends the vaginal mucous membrane greatly, and this distention is often very distressing to the patient. The extremity of the plate that is intended to be applied on the sacro-vertebral angle, is liable to slip and to become displaced; beside which, the organs situated in the excavation oppose its free use.

Madame Boivin endeavored to obviate most of the objections against Coutouly's instrument, by substituting a new one, which she called an *intro-pelvimeter;* which, although bearing a general resemblance to the former, differs essentially, in having its two constituent branches simply articulated, so that they may be unfastened and introduced separately; the one into the rectum, the plate of which is to be applied against the sacro-vertebral angle, and the other into the vagina, so as to place its vertical part behind the symphysis pubis. This instrument is perhaps less painful to the patient, and not so liable to be displaced as the other, but it will not furnish us any more accurate results. Besides, the introduction of a foreign body into the rectum is so disagreeable to most women that very few are willing to submit to it; for where, indeed, is the young girl (and Madame Boivin recommends it particularly for virgins) who would ever consent to its employment?

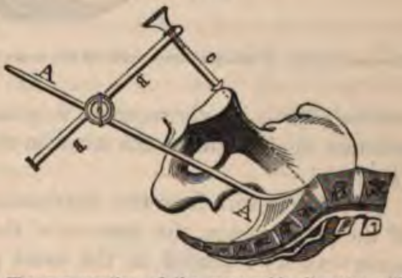
But it is unnecessary to allude here to all the other pelvimeters that have been proposed, and I shall only bring forward the one invented by Stein, which I should adopt rather than the preceding, because it is more simple and more easily applied. It is merely a metallic stem, of the length and size of the female catheter, provided with a slide, and having the metrical divisions marked on one of its surfaces. It is employed by passing its extremity along the forefinger, previously introduced into the vagina, until it reaches the sacro-vertebral angle; the external part is next pressed upwards, so as to bring the graduated face in contact with the lower portion of the symphysis pubis, and then, by means of the slide, the point on the stem corresponding to the symphysis is marked. The instrument is subsequently withdrawn, and all that part of it beyond the slide shows the length of the sacro-pubic diameter, or rather the interval existing between the sacro-vertebral angle and the inferior part of the pubis.

However, Stein's pelvimeter may be replaced by any straight rod whatever, upon which the finger will take the place of the slide.

Many very ingenious instruments have been proposed during the last few years, for the purpose of obviating the various objections we have urged against those just mentioned; such are Wellenbergh's, a description of which is given by M. P. Dubois in the twenty-third volume of the new edition of the *Dictionnaire;* and, more particularly, the one announced quite recently by M. Van Huevel, a professor at Brussels. This latter, in my estimation, has incontestable advantages over all the others; and I feel warranted in recommending its more general use.

It is composed of two round rods; an *internal* or vaginal one (Fig. 102, A A), flattened like a spatula at each extremity, and having, about the middle of its upper face, a small blunt hook, or catch, the concavity of which looks towards the outer extremity; the other, or *external* one, B B, is traversed at the upper end, and perpendicularly to its direction, by a long screw, C, which is drawn back by unscrewing. These rods are held together by means of a nut, or articular box, thereby forming a kind of compass, the legs of which can be lengthened out or shortened at pleasure, and can likewise be moved in every direction. A turn of the central screw in the nut presses them against each other, and retains them firmly in any desired position.

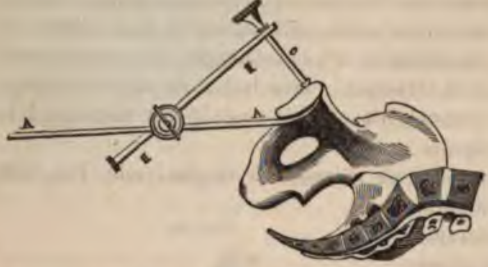
FIG. 102.



The mensuration of the sacro-pubic diameter with M. Van Huevel's pelvimeter.

When this instrument is to be applied, the woman lies on her back, having the legs, as well as the thighs, flexed and separated. We then begin by ascertaining, both exteriorly and interiorly, the exact situation of the upper border of the pubis, marking the skin with ink at the point corresponding to the middle thereof. The ilio-pectineal eminence on each side, just beyond the course of the crural artery, is next sought out and marked in the same way; so that the anterior extremities of the sacro-pubic and the two oblique diameters of the superior strait are indicated by the three ink-spots on the skin, which are afterwards easily found. This being done, one or two fingers of the left hand are introduced into the vagina, and placed on the angle of the sacrum; and then, with the other, the curved extremity of the vaginal rod is conducted along and under these fingers, which support it against the promontory, while the thumb of the same hand, pressed into the blunt hook, firmly retains it on the exterior. The right hand, which hitherto held the instrument, now turns the long screw, C, in the external branch, the button of which rests on the ink-spot made upon the mons veneris. While the operator thus holds the two branches in their respective positions, an assistant tightens the screw in the articular nut; when the instrument, being thus fastened, is carefully withdrawn (Fig. 102), and the distance between the two points, that is to say, the interval which separates the promontory from the anterior face of the pubis, is ascertained by a scale. This distance being known, the branches are rendered movable by unfastening the articular screw; and the operator again carries the left forefinger into the vagina behind the symphysis pubis, to which point he conducts the extremity of the vaginal branch (its concavity being in front), by slipping it along the palmar surface of this finger, and he sustains it there by one hand, whilst with the other he replaces the screw of the external branch upon the ink-spot on the mons veneris; taking care to avoid pressing more firmly than in the first operation; for it is only requisite to graze the skin without depressing it. The assistant again tightens the screw in the nut, and the operation is completed. (Fig. 103.)[1]

Fig. 103.



The mensuration of the symphysis pubis by the same instrument.

In order to withdraw the instrument, which now comprises the thickness of the pubic region, the screw C of the external branch is unfastened, and again exactly replaced in the same position after it is withdrawn. This distance is also measured, which, deducted from the first, gives a remainder that extends from the sacro-vertebral angle to the posterior face of the pubis, or, more properly speaking, the sacro-pubic diameter.

The oblique diameters can be obtained precisely in the same way. The index and middle fingers are carried into the vagina, and their extremities placed on one of the sacro-iliac articulations, or even, if this cannot be reached, on the promontory of the sacrum; the end of the vaginal branch is slipped up there in turn, and then the button of the screw C is fixed on the ink-spot corresponding to the right or the left ilio-pectineal eminence. The branches having been fastened in this position, are gently withdrawn from the woman's parts, and the distance between their points is taken by a graduated scale. In a second operation, the thickness of the cotyloid wall is ascertained by conducting the vaginal branch along the fingers behind this cavity, as far as the brim of the pelvis, and by replacing the button of the external branch over the ink-spot corresponding to the ilio-pectineal eminence. Is it necessary to repeat, that the soft parts in the groin are not to be depressed, and that the direction must correspond with the plane of the abdominal strait? The branches are subsequently fixed, and extracted by turning back the screw C, as described above; when, by deducting this second thickness from the first, the remainder will show the extent either of the oblique diameter, or that of the sacro-cotyloid interval, according as the vaginal branch had originally been placed on the sacro-iliac symphysis or upon the promontory of the sacrum.

We may observe here that the opening between the promontory and the cotyloid wall is the most essential to be known in cases of oblique deformity; for the sacro-iliac articulation is never deformed (saving where an exostosis or some other tumor is developed on its surface); but it is rather the base of the sacrum, or the cotyloid cavities which project into the hollow of the excavation. In fact, the pelvis sustains the vertebral column behind, while in front and laterally it rests on the thigh bones; and, therefore, it lies between two forces, which, in the erect position and in walking, have a continual tendency to depress this osseous ring at the three points indicated. Whence it follows that, if there is any softening, there will be a forward projection of the sacral angle, or a pressing backward of the acetabula; that is to say, a contraction of the antero-posterior diameter, and of the right and left sacro-cotyloid intervals, which, in the normal state, are only from three to three and three-quarter inches in extent.

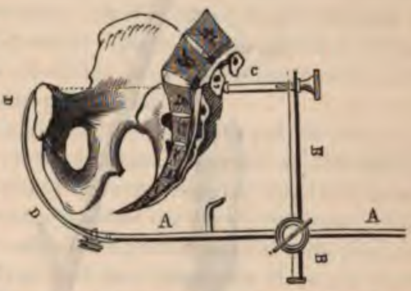
---

[1] If the hook should impede the sliding of the branch B B, it might be removed.

As regards the external measurement, we can convert the pelvimeter into a common compass for the inferior strait, by taking the handle part of the two branches, and properly adjusting the nut; these being placed on the tuberosities of the ischia, or one at the point of the coccyx, and the other under the pubic arch, we are enabled to take the transverse and the antero-posterior diameters of this strait directly.

Lastly, by adding a piece to the apex of the vaginal branch (Fig. 104, D D), we form a species of callipers similar to the mecometer of Chaussier. This piece is first flattened out like a spatula, and then curved; and its concavity is placed along the anterior surface of the pubis; the branch that supports it passes backwards between the woman's thighs; and the button of the screw C, traversing the other branch, is pressed on the spinous process of the last lumbar vertebra.[1] The operator holds the extremities of the instrument in his two hands, whilst an assistant tightens the screw in the articular nut. It is disengaged by turning the screw C backwards, when necessary, which is returned to its place before measuring the interval between the points with the scale. (Extract from the *Memoir of M. Van Huevel.*)

FIG. 104.



The same instrument converted into a pair of callipers.

---

[1] If, says M. Van Huevel, the tubercle of the spinous process of the last lumbar vertebra cannot be detected, the following process may be had recourse to: Stretch across this region a string which shall rest upon the upper and middle part of the crests of both iliac bones; then at the distance of an inch and a half below this line, upon the middle of the sacrum, make a mark, from which the string is to be conducted obliquely forward and downwards toward the upper part of the cotyloid parietes and of the mons veneris. The position of the string, which should follow the inclined direction of the plane of the superior strait, may be rectified, if necessary, by the fingers. Then with an uncut quill dipped in ink, the points to be preserved are marked out along the line of the cord. These points should be made lower at the pectineal eminences and at the pubis, by from one and a half to two and a half inches, than the described limit, in order to correspond better with the contraction of this strait.

In February, 1855, the ingenious accoucheur of Brussels improved his first pelvimeters, besides suggesting another, which appears to me quite as simple, and of more general applicability than the preceding. I therefore think it right to give a detailed description of it.

It is simply a pair of callipers (Fig. 105) composed of two branches, one of which is fixed, and the other movable. The first, A B, is eleven inches in length, slightly curved, and flattened at its extremity; it is inserted into the vagina for the internal measurement, and bears a hooked ring near its middle, beyond which is a non-graduated arc of a circle. It articulates

Fig. 105.

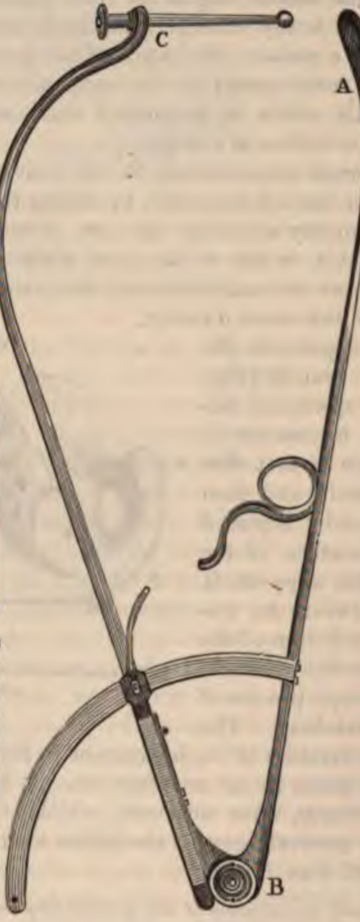


Fig. 106.

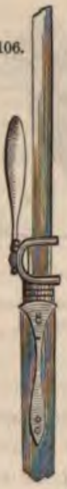
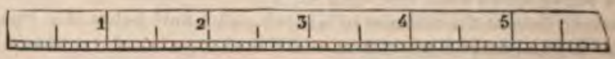


Fig. 107.



below, like an ordinary pair of compasses, with the prolongation of a sheath, in which is inserted the lower extremity of the other branch. The curvature, length, and hooked ring, are the same as in the small geometric pelvimeter.

The second or external branch, C B, may be lengthened or shortened at pleasure. It carries at its upper extremity a long horizontal screw, like the preceding pelvimeter, for the purpose of facilitating the disengagement of the compass after its internal application: from thence it curves outwardly, and, finally, in descending becomes straight and quadrangular, and enters the above-mentioned sheath. The latter, which is open at both ends, is furnished with a groove externally, for the purpose of receiving a projection of the branch, which prevents its escaping from the sheath. Its inner side is provided with a spring bearing a point, which passes through the side, and lodges in a small hole in the branch, so as to prevent the latter from slipping up and down, and to keep the two extremities of the branches on the same level. When the spring is raised, the point escapes from the hole in the stem, which then becomes movable; when released, and pressing upon its surface, it keeps it at any height desired.

The arc of a circle attached to the vaginal branch is applied against the right side of the external branch. A slide (Fig. 106) is traversed by the latter at right angles, and also by the arc. On the opposite side is fixed a vice, moved by a lever, which presses these two pieces together, and prevents all motion. Lastly, a graduated scale (Fig. 107) serves to measure the distance between the extremities in any given position.

Let us now examine the mode of application of the new pelvimeter.

The compressing vice of the slide is relaxed, and the point of the spring engaged in the small hole of the external branch keeps the extremities of the instrument on the same level, so as to form a pair of callipers. The extremities are applied either to the anterior superior spinous processes of the iliac bones, to the crest of the ilium and the tuberosity of the ischium of the same side, or the bottom of the horizontal screw is placed upon the spinous process of the last lumbar vertebra, and the extremity of the vaginal branch against the mons veneris by passing between the thighs of the patient; again, one may be applied to the upper, and the other to the lower edge of the pubis, to the tuberosity of each ischium, or, finally, upon the coccyx, and under the pubic arch.

Thus are obtained the extent of the transverse diameter of the greater pelvis, the depth of the entire cavity, the distance from the loins to the pubis, the length of the symphysis pubis, and the transverse and antero-posterior diameters of the inferior strait, the value of each of which is determined by the scale.

To measure the interior of the pelvis, the woman is placed on her back on the bed, with the breech brought to the edge of the mattress. The extremities of the diameters of the superior strait are marked in the manner already described, with the aid of a cord and a quill. Then, one or two fingers of the left hand are introduced into the vagina as far as the promontory of the sacrum. The right hand holds the callipers unfastened and opened to its full extent, and with the external branch depressed in its sheath. The extremity of the vaginal branch is next passed into the genital organs along the previously introduced fingers, which press it against the sacro-vertebral angle, whilst the base of the thumb engages itself in the hook. The instrument is held motionless in its position by a single hand. Then, the thumb, fore, and middle fingers of the right hand grasp the external branch above the arc of a circle, and raise or lower it in its sheath until the button of the horizontal screw corresponds to the mark made upon the mons veneris. As soon as this is effected by *merely grazing the skin,* the ring-finger presses the lever of the vice forwards, to fix the instrument in its place. It is then withdrawn from the woman's parts, and the distance between the two extremities ascertained by means of the scale.

The first stage of the operation being accomplished, the vice is relaxed, and the extremities of the callipers again made to correspond. The index finger of the left hand is again introduced into the vagina, and applied this time behind the pubis. The extremity of the vaginal branch is conducted thither, with its concavity in front, by the right hand. As soon as it has reached the upper edge of the symphysis, the branch is seized with the entire hand, and the little finger passed into the ring of the hook. The external branch is afterward seized above the arc by the three first fingers of the right hand, and the ring-finger pushes the lever of the vice forward, as soon as the button of the horizontal screw corresponds to the spot on the mons veneris. This second application should be made as gently as the first, merely *grazing the skin.* Should any difficulty be experienced in the withdrawal of the pelvimeter, the horizontal screw may be screwed back, provided it be restored to its position after the extraction. The distance between the extremities should be again measured by the scale, and subtracted from the first result, to obtain the extent of the sacro-pubic diameter.

The only error possible in this process results from the unequal pressure upon the skin in the two applications, or else upon the irregular position of the branch behind the pubis, which may be either higher or lower than the sacro-pubic line itself. A little attention only is necessary in order to avoid these slight causes of error.

The proceeding is exactly the same for obtaining the oblique diameters. The pelvimeter is first loosened, opened widely, and the external branch lowered in its sheath. If the left sacro-pubic space is to be measured, the instrument should again be taken in the right hand; the fore and middle fingers of the other hand are introduced into the genital organs, and placed to the left of the pre-vertebral projection; then the extremity of the vaginal branch is passed up to the point indicated, and retained there by the fingers of the right hand; the button of the external branch is placed upon the mark over the left ilio-pectineal eminence, and the vice is tightened by the ring-finger. The instrument, in its diagonal position, is withdrawn from the parts, and the distance between the two extremities ascertained by the scale.

Having noted the latter, the vice is unfastened, and the two extremities of the callipers brought together. Then the fore and middle fingers of the left hand are again introduced into the vagina behind the left ilio-pectineal eminence, as also the extremity of the vaginal branch with its concavity forward; the branch is next grasped with the left hand, and the little finger introduced at the same time into the ring of the hook. The thumb, fore, and middle fingers of the right hand replace the button of the external branch upon the mark over the left ilio-pectineal eminence, whilst the ring-finger presses upon the lever of the vice. The same precaution should be taken, as in the first instance, of turning the horizontal screw, if necessary, in order to withdraw the instrument, and to return it to its place, for the purpose of measuring the new distance between the extremities. The subtraction of this quantity from the other gives the dimensions required.

The right sacro-pectineal distance is ascertained in the same way, except that the fingers of the right hand are then introduced into the vagina, the instrument being held in the left hand.

Finally, the measurement of the transverse diameter of the superior strait is accomplished in nearly the same manner. The callipers being prepared as usual and held in the right hand, two fingers of the left hand in a state of forced supination, the thumb being directed downwards, are carried to the right side of the pelvis. The convexity of the vaginal branch is directed toward that point, and held there by the pressure of the introduced fingers, and by the left thumb, which is engaged in the hook. The free hand conducts the external branch beneath the left thigh, which is raised for the purpose, and places it upon the mark made upon the corresponding hip. The ring-finger of the right hand fixes the instrument in its transverse position by pressing upon the lever of the vice, and the distance between the extremities is measured by the scale after the extraction.

To make the second application, the vice is relaxed, and the external branch elongated beyond the extremity of the vaginal one; then, the fore and middle fingers of the left hand are placed in the genital organs on the left side of the pelvis. The extremity of the vaginal branch is conducted thither by the right hand, and kept there by the left hand, the little finger of which is inserted in the ring of the hook. The external branch is finally directed by the free hand beneath the left thigh upon the hip of the same side, and fixed as usual. The horizontal screw is next turned for the purpose of withdrawing the pelvimeter. When restored to its place, the distance between the extremities is again taken, and this, subtracted from the first measurement, gives the length of the transverse diameter.

The diameters of the excavation may be measured in the same manner; it being only necessary to take the precaution to mark spots around the pelvis between the limits of the superior and inferior straits.

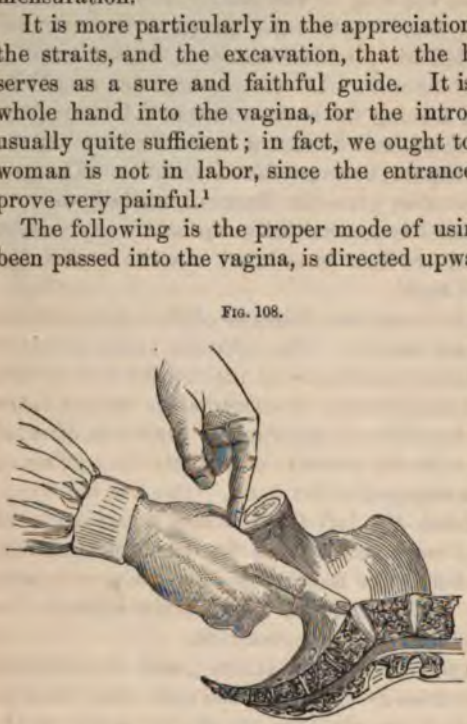
But, after all, the hand of an accoucheur, accustomed to practise the touch, is certainly the best and most satisfactory of all pelvimeters; for, with the exception of a few rare cases, in which I would give the preference to the instrument last described, it is always possible to ascertain exactly by it the external form of the pelvis, and also, by its introduction into the vagina, the perfect or defective conformation of the cavity.

By the exterior palpation, we are enabled to learn the external characters of the pelvis, to find out what interval exists between the two iliac crests, and to measure the depth of the anterior, the posterior, and the lateral walls of the pelvis; and this might possibly be all-sufficient; alth [illegible] n our opinion, it is better to resort to the callipers of Baudelocque for the external mensuration.

It is more particularly in the appreciation of the dimensions of the cavity, the straits, and the excavation, that the hand introduced into the parts serves as a sure and faithful guide. It is not even necessary to pass the whole hand into the vagina, for the introduction of one or two fingers is usually quite sufficient; in fact, we ought to be satisfied with this, when the woman is not in labor, since the entrance of the entire hand would often prove very painful.[1]

The following is the proper mode of using the finger: the index having been passed into the vagina, is directed upwards and backwards towards the sacro-vertebral angle, which is easly recognized by its prominence, and by the transverse depression formed at the lumbo-sacral articulation. When the extremity of the finger is well applied against this part, the wrist is carried upward and forward, until the radial border of the finger comes into contact with the lower margin of the symphysis pubis (see Fig. 108), when the index of the other hand (the precaution having previously been taken to separate the labia externa and the nymphæ) is applied with its back against the vestibule upon which it is slid until the end of the nail touches the finger in the vagina. The two

FIG. 108.



---

[1] It is a great mistake, says M. Guillemot, to suppose that it is possible to measure the length of the sacro-pubic diameter, by the introduction of a single finger into the vagina. This result has never been effected when the diameter has exceeded two and a half or three inches in length; and the dimensions of the strait can only be correctly obtained by using the whole hand.

Like M. Guillemot, we believe that the hand should be introduced, whenever it can be done without causing too much suffering to the patient; but we have elsewhere stated that it was often very painful, even at the moment of labor; and we will add, that at any other period it would appear useless, since the finger alone, by depressing the perineum, might measure as far as three and a half inches, unless there was an unusual resistance at this part, and beyond this a natural delivery is possible; or, at least, if the intervention of art should become necessary, it could always be terminated favorably to the lives both of the mother and child; and, therefore, nothing need be done until the time of parturition.

During labor, says M. Velpeau, we can, if necessary, introduce the entire hand into the vagina; the thumb and index finger are then separated, so as to place the one on the sacro-vertebral angle, and the other behind the pubis; the hand is withdrawn while in this position, and, by the aid of a measure, the dimensions of the sacro-pubic diameter are determined with one or two lines. I have sometimes used the index and middle fingers, carried high up into the vagina, with advantage; and then, after having separated them as much as possible, and placed their extremities on the diameter that is to be measured, two fingers of the other hand are inserted between their fingers should come together precisely at the lower edge of the symphysis pubis. Pressure with the nail will make a sufficient mark upon the finger of the right hand. The latter finger is then to be withdrawn and applied to a rule. In this way the distance between the sacro-vertebral angle upon which the end of the finger rested and the lower edge of the symphysis pubis is very readily determined. But this oblique line is longer than the antero-posterior diameter of the upper strait, which terminates in front, on the posterior superior part of the symphysis; consequently the excess must be deducted; and, by subtracting four or five lines for a large pelvis, and three to four for a small one, we shall have very nearly the extent of the sacro-pubic interval. With regard to the exact number of lines to be deducted, the attention should further be directed to the thickness, the length, and the more or less marked obliquity of the symphysis; which circumstances can easily be determined by the touch.

Of all the methods, measurement by the finger gives the best results; but it should be done carefully, and precisely in the manner described above. If the separation of the greater and lesser labia be neglected, or if the nail be not applied accurately against the lower part of the symphysis, the measurement obtained will necessarily be inaccurate.

The finger introduced into the parts will also be able to appreciate the extent of the antero-posterior diameter of the excavation; for it can very readily pass over the whole front surface of the sacrum; and, consequently, can judge whether its anterior concavity is augmented or diminished.

Lastly, its extremity being applied against the point of the coccyx, the accoucheur should again elevate his wrist until the radial border of the hand is arrested by the lower part of the symphysis; then, marking this point with the other forefinger, he should withdraw the hand and apply it to a graduated scale, and he can thus ascertain very correctly the extent of the coccy-pubic diameter; further, by pressing gently on the point of this bone, he can judge very readily of the degree of mobility in the sacro-coccygeal articulation. In cases of deformity caused by the excessive length or unusual obliquity of the pubic symphysis, the direction of the vulvar opening will be so much changed as to attract attention; it being then situated much more posteriorly than in well-formed women.

Although the results furnished by the touch are perfectly satisfactory as regards the antero-posterior diameters, it is far otherwise with the transverse and oblique ones, particularly at the superior strait; for the extent of these

---

bases, to prevent them from changing their relations while being withdrawn from the woman's parts. But these directions, given by M. Velpeau, appear to us impracticable at the superior strait, and equally so as regards the bis-ischiatic interval.

Ramsbotham's process resembles nearly Velpeau's. He introduces the fore and middle fingers into the excavation; the bent extremity of the forefinger is applied closely against the symphysis pubis and the end of the strongly-extended middle finger endeavors to reach the sacro-vertebral angle; then withdrawing *the fingers in the same position*, the space between their extremities is, he says, to be measured by a rule or a pair of compasses. He states that this process has the advantage of giving the exact dimensions, even when the head is engaged in the excavation, since one finger can be passed behind it and the other before it. (*Obstetric Med. and Surg.*, p. 18.) We consider this procedure quite as unavailable as that recommended by M. Velpeau.

can only be judged of approximately, and we can do nothing more than test with the finger the dimensions obtained by the external mensuration. The finger, when entered, is to be carried in the direction of those diameters, and the accuracy of the result thereby obtained will depend on the experience and tact of the accoucheur. However, we shall soon have occasion to be more explicit on this point, by extracting from the works of MM. Nægèle and Danyau the results of their researches.

As to the transverse diameters of the inferior strait, their dimensions can evidently be ascertained by the aid of the fingers.

Again, the educated finger will give a very just idea of the length of the symphysis pubis, the spreading and height of the pubic arch, the depth and normal configuration or deviation in the lateral walls of the excavation, and of the inward prominence of the ischiatic spine.

The existence of the various tumors that may obstruct the pelvic cavity, or greatly diminish the canal intended for the passage of the child, can be recognized by the finger alone; for it can detect their nature, their softness, or resistance, and their mobility, or adhesion to the osseous parietes, or to the soft parts which line the latter, far better than any other instrument. But during parturition, the touch, which is so often useful at other times, may not prove adequate to this measurement; for, if the contraction is not very extensive, the head, after being arrested for a long time, may finally engage at the upper part of the excavation, and form a considerable rounded tumor just below the superior strait, large enough to prevent the finger from passing up to the sacro-vertebral angle; and if the sacrum should then happen to be strongly pressed backwards, as is most commonly the case, so that the antero-posterior diameters of the excavation and of the inferior strait are increased, the cause of the head's arrest might be misunderstood, if the accoucheur does not bear in mind that, before engaging, it remained for some time above the symphysis pubis. The attention, however, will be awakened, if the finger, in traversing the anterior surface of the sacrum from above downward, detects the absence of its normal curvature. The sacro-vertebral angle may, however, be reached quite frequently by passing the finger around the head; but the tumor formed by the œdematous scalp sometimes projects so far into the cavity of the pelvis, as to render it impossible to measure a straight line from the promontory to the lower part of the pubis.

We repeat, that the accoucheur's finger is the most perfect of all instruments, though its importance must not be overrated. In fact, many practitioners have erred in declaring, with Madame Lachapelle, that the best proof of a good conformation of the pelvis is the impossibility of reaching the sacro-vertebral angle with the finger. Certain others, while admitting the imperfection of the other methods of exploration, equally err in supposing that an estimate, correct enough to guide us safely in practice, will be obtained by employing them simultaneously; because, there are some cases where the best known methods of exploration are inadequate, where the finger cannot reach the promontory of the sacrum, and yet where a mutilation of the fœtus, and sometimes even the Cæsarean operation, have been necessary.

The oblique oval pelvis belongs to this class; and M. Nægèle, who described it with so much care, after having experienced the inefficiency of the means of diagnosis usually employed, has made some researches, with the view of overcoming this difficulty; for which purpose he has taken points on the pelvis different from those described by most authors, which are easily accessible and recognizable; and he has carefully measured the distances between them in the normal state, as already pointed out (page 653, Nos. 6, 7, 8, 9, and 10). "In forty-two pelves of well-formed females, we have found," says he, "in a large majority of cases, but little or no difference between the two sides of the same pelvis, as respects the above-mentioned distances." M. Danyau, responding to the wish expressed by M. Nægèle, has repeated those researches in a great number of living and well-formed women, and the following are the conclusions at which he has arrived, namely, that in eighty females it appeared:—

1. That the distance from the tuber ischii of one side to the posterior superior spinous process of the opposite ilium, was the same on both sides in twenty-one persons; in fifty-one, the difference between the two sides was from one to three lines; and in eight only it amounted to four, five, and six lines; whilst, in the oblique-oval pelves, the smallest difference was found to be one inch, and the greatest two inches.

2. That the distance from the anterior superior spinous process of one side to the posterior superior iliac spine of the other, was the same in both halves of the pelvis in twenty-two females; in fifty-one there was a difference of one to six lines between the two; and in seven women only was this difference from seven to eleven lines. In the oblique-oval pelves, the smallest difference between these sides was three-quarters of an inch, and the greatest two inches.

3. That the distance from the spinous process of the last lumbar vertebra to the anterior superior iliac spine, was the same on both sides, in twenty-nine instances; in fifty-one, there was a difference of one to seven lines between the two. But in the oblique-oval pelves, the least difference was eight lines, and the greatest an inch and a third.

4. That the distance from the trochanter major of one side to the posterior superior iliac spine of the opposite one, was the same in eighteen cases; when measured comparatively on the two sides of the pelvis, a difference of one to six lines in this distance was found in fifty-seven; and in five only it ranged from seven to nine lines; whilst, in the oblique-oval, the smallest difference was half an inch, the greatest an inch and a half.

5. That the distance from the lower border of the symphysis pubis to the posterior superior iliac spine, was the same on both sides in thirty-two women; in forty-six, the difference between the two halves of the pelvis, in this respect, was from one to six lines; and in two, from eight to nine lines; but, in the oblique-oval pelves, the least difference in this distance, taken on both sides, was seven lines, the greatest one inch.

It will, therefore, appear that, by a proper degree of care, and the aid of the measurements just given, we would be able to recognize the deformity in question, by measuring the aforesaid distances on each side, and then comparing the results obtained from both.

But there is yet another method for detecting the oblique-oval pelvis, says M. Nægèle; that is, if a woman, having a well-formed pelvis, be placed with her back against any vertical plane, as a wall, for instance, so that the shoulders and upper part of the buttocks be in contact with this plane, and then two plumb-lines be dropped, the one from the point corresponding to the spinous process of the first sacral or the last lumbar vertebra, and the other from the lower border of the symphysis pubis, it will be found that the latter nearly or quite covers the first; that is to say, that a line perpendicular to the wall would intersect both of these plumbs at a right angle; but this is not the case in the oblique-oval pelvis. In fact, one of its essential characters is, that the symphysis pubis is deviated towards one side, and the sacrum towards the other, whence the middle of the pubic symphysis is opposite to the anterior sacral foramina, or even to the sacro-iliac articulation on the non-anchylosed side. Consequently, when a woman, whose pelvis is thus deformed, assumes the position just indicated, and the plumb-lines are dropped at the designated points, the operator will find, by bringing his view perpendicular to the wall, that the line placed in front does not cover the posterior one; for the latter will deviate to the right or the left, according to the anchylosed side, and this deviation will be the more considerable, as the pelvis is the more deformed. (*M. Danyau's Translation.*)

ARTICLE V.

INDICATIONS PRESENTED BY THE DEFORMITIES OF THE PELVIS.

It is not our intention to treat, in this place, of the measures that it would, perhaps, be advisable to employ for the purpose of remedying deformities of the pelvis when they exist, for this subject belongs exclusively to the surgery of the osseous system; besides which, the various mechanical and gymnastic means hitherto used for correcting the deformities of the skeleton have had no efficacy in changing the form of the pelvis. But, if nothing can be done by the physician to cure, he is, at least, not wholly destitute of resources where there is still a possibility of preventing such deformities. Thus, during the earlier periods of life, especially, he ought to watch over all the circumstances that might influence the regular development of the skeleton, with the most tender solicitude; he should relieve rachitic children from constriction or pressure of every kind, which might, in their variable attitudes, modify the pelvic circumference; they ought to be left in the recumbent position as much as possible; the nurse must not always have the child in her arms, as she is very apt to have, if not cautioned; and great care is requisite not to permit them to walk too soon, not, indeed, until their bones have acquired a proper degree of solidity; and even then it should be by degrees, and only in proportion as their strength increases. We must not yield, says M. Bouvier, to the chimerical fears of augmenting the debility by depriving children of a necessary exercise; for repose, on the contrary, is much better suited to that state of languor which they generally exhibit; and, besides, we may obtain, by passive motion, by exposure to sunlight, and by general movements in the horizontal position, a sufficient compensation for the state of inaction in which they are kept during a part of the day.

The indications presented by the deformities in the pelvis, considered only with regard to the unfavorable influence they may have upon the puerperal functions, will evidently vary with the degree of deformity. When studying this influence, we classified all the malformed pelves in three categories, namely: all those having three and three-quarter inches, at the least, in their smallest diameter, were placed in the first; in the second, we have included those presenting two and a half inches, at least; and in the third, those whose smallest dimensions are under two and a half inches; and, following the example of Professor Dubois, we shall still preserve this division in the study of the indications offered by the deformities.[1]

§ 1. WHAT IS TO BE DONE WHEN THE CONTRACTION IS SUCH, THAT THE PELVIS MEASURES AT LEAST THREE AND THREE-QUARTER INCHES IN ITS SMALLEST DIAMETER?

In such a case, the child may evidently present either by the vertex, the pelvic extremity, the face, or the trunk.

A. *Where the Child Presents by the Vertex.*—We have elsewhere stated that a spontaneous delivery is possible under such circumstances; and, consequently, that the wisest course is to wait and trust to the efforts of nature. But where the uterine contractions are exerted in vain for a long time after the membranes are ruptured, and the amniotic waters are partially discharged without the head making any progress, an application of the forceps is the only remedy to which we can resort.[2] But the exact moment for the employment of this measure is to be determined with greater precision. As a general rule, we may wait six, seven, or even eight hours after the membranes give way, and after the os uteri is fully dilated; and then, if energetic contractions have been uselessly exerted during all this time to overcome the obstacle, it will be necessary to interfere, and to apply the forceps; though it will be advisable to act a little more promptly where the head, after having been engaged for some time in the excavation, is arrested by a contraction of the inferior strait; and the same would be true if this strait were regularly formed, and the arrest of the head were dependent on a feebleness of the uterine contractions occasioned by the previous efforts on the part of the organ to force it through the contracted superior strait. It is unnecessary to add, that if any accident whatever, grave enough to endanger the health of the mother or the life of the child, should occur during the labor, it would demand a more prompt intervention of art. Most generally, the frequently repeated auscultation of the pulsations of the heart would be satisfactory as to the child's condition, though even here only a certain degree of confidence can be reposed in this sign.

---

[1] I am happy to state that most of the following considerations and practical views are deduced from the excellent thesis which M. P. Dubois sustained with so much credit in the *concours*, at the close of which he was nominated. I congratulate myself on being the first to give publicity to a work that is, unfortunately, but too little known.

[2] It is highly important not to confound in practice the constantly increasing tumefaction of the hairy scalp with an actual descent of the head. For, when the labor is retarded, the sero-sanguineous tumor, formed by the soft parts, continually augments in volume, and its summit gets nearer and nearer to the vulva; and, therefore, unless the precaution is taken to get an osseous portion of this region as a point of departure, the accoucheur might suppose that the head was traversing the excavation, and approaching the inferior strait, when, in reality, it did not move.

B. *Where the Child Presents by the Pelvic Extremity.*—When describing the mechanism of natural labor, we expressly recommended that no traction should be made on the pelvic extremity in breech presentations, with the view of avoiding the straightening out of the arms and an extension of the head; and we still insist on the same precept here. Nevertheless, in the case before us, if the largest part of the trunk is delivered, and the expulsion of the head is unusually delayed, it would be proper to hasten the termination of the labor by a moderate traction on the body; for such attempts, if well conceived and well directed in the line of the pelvic axis, would prove sufficient in most cases to accomplish the delivery. If, however, they are ineffectual, it will then be necessary to apply the forceps. (See *Version.*)

C. *Where the Child Presents by the Face.* — Although face presentations may terminate naturally in the majority of cases where the pelvis is well formed, it is not the less true, as elsewhere demonstrated (p. 345) that the labor is somewhat more painful to the mother, and is, besides, more dangerous for the child than in others. If, therefore, these difficulties, resulting from the position itself, are superadded to those which exist as a necessary consequence of the contraction, there can be no doubt that a delivery, left entirely to nature, would be attended with a very considerable risk to the fœtus. Under such circumstances, M. P. Dubois recommends the conversion of the face position into one of the vertex, by flexing the head, and then the application of the forceps, if the uterine efforts remain fruitless after the change. It appears to us that this cephalic version would be quite as difficult as the pelvic, if attempted long after the membranes are ruptured, and we should give preference to the latter, which, generally, would enable us to dispense with the use of the forceps. (See *Forceps.*)

D. *Where the Child Presents by the Trunk.*—If the contraction is discovered before the membranes are ruptured, or very shortly after, and the fœtus is very movable, we should endeavor to convert the presentation of the shoulder into one of the vertex, and then leave the expulsion to the efforts of the womb; but after the waters are discharged, the contraction of the organ renders the introduction of the hand and the cephalic version so difficult, that I consider turning by the feet much easier and less dangerous.

The pelvic version, in the case before us, is attended with some peculiarities that ought to be mentioned. For instance, where an undue development of the sacro-vertebral angle is the cause of the narrowing, it often happens, as before shown, that the base of the sacrum is turned a little to the one or the other side at the same time that it is projected forward, thereby constricting one half of the pelvis much more than the other; and hence, in performing the evolution of the fœtus, and drawing on its pelvic extremity, under such circumstances, it would evidently be requisite to turn its posterior plane towards the larger half of the pelvis, so that, when the head presented at the superior strait, its large occipital extremity would correspond to the non-retracted side.

It was stated above that when the fœtus presented by its flexed cephalic extremity, it would be necessary to apply the forceps, if the uterine efforts were incapable of terminating the labor; but the particular variety of malformation that we are now treating of may modify the rule laid down, which was perhaps a little too absolute; for, in this case, the position of the head must greatly influence the accoucheur's determination. Let us take, for example, a pelvis whose sacro-vertebral angle while projecting forward is turned to the right, so as to diminish the sacro-cotyloid interval very considerably on this side; now, the intervention of art being judged necessary, if the head is placed in the left occipito-iliac position, an application of the forceps will be the only practicable measure; whereas, on the contrary, if the occiput is directed to the mother's right, we should preferably resort to the pelvic version. This last operation, by converting a second vertex position into the first of the feet, would have the advantage of bringing the great occipital extremity of the head to the largest side of the pelvis, and would thus place the fœtus in a much more favorable position.

The delivery has frequently been rendered comparatively easy by the pelvic version when resorted to under such conditions; and M. Velpeau relates a case which he terminated successfully by this manœuvre, though other practitioners had deemed craniotomy to be indispensable in a former labor of the same woman.

The recommendations just made have the double object of sparing the mother from useless suffering, and more particularly of relieving the fœtus from the danger it would incur from a prolonged labor. Whence, it is evident, that the accoucheur's course will be somewhat different in those cases where there is a certainty that the child is not living; for, having nothing to fear on its account, he might accord a much longer time to the uterine contractions, especially as the head, which is then softened and reducible, contributes far more to an easy expulsion than under other circumstances. Consequently, he ought not to interfere in such cases, until he has ascertained positively, by a proper delay, the absolute inefficiency of the natural forces.

The child's death may also modify the precept above given in the trunk presentations, since the cephalic version was only recommended because it is more advantageous for the infant; therefore, after its death, the pelvic version would be preferred as being less painful to the mother.

§ 2. WHAT IS TO BE DONE WHEN THE DEGREE OF CONTRACTION IS SUCH THAT THE PELVIS MEASURES THREE AND THREE-QUARTER INCHES AT THE MOST, AND TWO AND A HALF INCHES AT THE LEAST, IN ITS SMALLEST DIAMETER?

If the fœtus dies before or during the labor, and the uterine contractions are ineffectually prolonged, we should, doubtless, prevent the dangers the mother might undergo from the delay, by resorting to embryotomy, and the application of the ordinary forceps, or even of the embryotomy forceps.

Again, if when the accoucheur is summoned to the patient, the membranes have been ruptured for some time, and the waters are partially or wholly evacuated; if the uterine contractions are exerted on the child's body alone, or repeated attempts at extraction have been made without success; if, in a word, the child's life has been compromised, either by the length of the labor or the useless intervention of art,—in all such cases it may be regarded, though still living, as non-viable, and embryotomy is considered by most modern accoucheurs to be the only proposable measure. We ourselves held this opinion for a long time, but being rather less fearful of the probable consequences of pelvic version in contractions of the pelvis, we now think, that so long as any chance remains in favor of the child, the latter operation should first be attempted. Craniotomy can always be had recourse to, if, after the disengagement of the trunk, it should be found impossible to extract the head.

But where the degree of contraction alluded to is detected at the commencement of the labor, before the membranes are ruptured, and consequently at a time when there is no reason for supposing that the viability of the fœtus has been compromised, what ought to be done?

Following the example of M. P. Dubois, we shall here admit a further subdivision into two classes, namely: one, where the pelvis has an extent of three and three-quarter inches at the most, and three inches at the least; and the other, where it has but three inches at the most, and two and a half inches at the least, in its smallest diameter.

In the former case, after having waited for all that can reasonably be expected from the uterine contractions, the forceps are to be applied when the vertex presents favorably. Should the attempt prove fruitless, the contractions may be allowed to continue for an hour or two longer, when, if ineffectual, the instrument is again to be had recourse to. If moderate tractions are found to be insufficient, the instrument should be withdrawn, and pelvic version attempted, in the hope of extracting a living child. (See Art. *Forceps, Appreciation.*) If no favorable result follows this second application of the forceps, we are in the conditions above mentioned, and the life of the child being certainly compromised, we are authorized in preferring craniotomy to an operation which might prove disastrous to the mother; I allude to the symphyseotomy or the Cæsarean operation.

But should the child present by the face, trunk, or breech, turning is to be preferred. (See *Appreciation of the Forceps.*)

When the pelvic diameters afford but from two and three-quarters to three and a quarter inches, the indications to be fulfilled remain the same; but the difficulty experienced in executing the manœuvres leaves no alternative but a bloody operation. (See *Symphyseotomy*, and *Embryotomy.*)

The various degrees of contraction, when ascertained long before the termination of pregnancy, present new indications to the practitioner; these, in fact, are the cases in which the induction of premature labor is to be resorted to. The recommendation to subject pregnant women with contracted pelves to a restricted diet and repeated blood-letting during gestation, applies also to the degree of narrowing under consideration, and more especially to those cases in which the smallest diameter amounts to at least three and a quarter inches. The value of these two methods will be discussed hereafter.

§ 3. What is to be done when the Dimensions of the Pelvis are under two and a half Inches?

If the child is living, we have, evidently, only to choose between the Cæsarean operation and the mutilation of the fœtus, for apart from some exceptional cases (see page 646), its spontaneous or artificial expulsion is here physically impossible. (See *Cæsarean Operation.*) But if it is dead, or if, in consequence of the duration of the labor, and the repeated attempts at extraction which have been made, there is reason to believe that its viability is so compromised that it might be considered as incapable of surviving after its birth, the indications will vary according to the degree of contraction.

Where, under these latter circumstances, the pelvis offers enough space in its smallest diameter to enable us to hope that, by reducing the size of the parts by craniotomy, the delivery can be accomplished without subjecting the mother to any very serious dangers, the mutilation of the fœtus should be resolved on, and its extraction effected by aid of the embryotomy forceps. But when the diameter is barely over an inch, we can no longer think of extracting the child by the natural passages; and the Cæsarean operation is then alone admissible. It is very important to know that with less than two inches, cephalotripsy becomes very difficult, because then the extraction of the base of the cranium, after the perforation of its vault, and the evacuation of its cavity, requires such numberless gropings and violent efforts, such repeated and grievous pressures and distentions, that the chances for the mother's safety after these painful attempts, which are sometimes made without any benefit, are not more favorable than those which follow the Cæsarean operation. Under these circumstances, M. Pajot proposes crushing simply, without traction. (See *Cephalotripsy.*)

In our remarks, thus far, we have supposed that the child always presented by its cephalic extremity; but, in order to fill up the outline we have traced, it is now necessary to point out what must be done when the pelvic extremity presents, the pelvis affording two and a half inches at the most. Under such circumstances, the head still adhering to the trunk after the escape of the latter, or entirely separated from it by decapitation, may become arrested above the superior strait. If, then, the least diameter of the pelvis amounts to two inches, craniotomy, and the application of the embryotomy forceps, will evidently be indicated. But if the contraction be still greater, it would be necessary, after having diminished the volume of the parts, and attempted in vain every effort at extraction compatible with the mother's safety,—it would be necessary, I repeat, to separate the head from the trunk, by dividing the neck, and to abandon its expulsion entirely to nature; for, notwithstanding all the dangers to which the woman would then be exposed, this would be better than the Cæsarean operation, performed after the almost total contraction of the womb.

If nothing has hitherto been said concerning a faulty direction of the axis of the pelvis, it was only because, like Professor Nægèle, we do not attach to this particular variety of defective conformation all the importance that Lobstein and many other accoucheurs have attributed to it. The degree of inclination of the superior and inferior straits may depart widely from the figure before given as expressing the average normal condition. Thus, the plane of the abdominal strait may be so inclined downwards as to be sometimes quite vertical, as in a woman described by M. Nægèle; while, at others, there is no inclination at all, being then almost horizontal; finally, the upper part of the symphysis pubis may be more elevated than the sacro-vertebral angle, the plane being inclined from above downwards, and from before backwards, as in the case reported by M. Bello. (*Transactions Médicales*, t. xiii. p. 285.) The plane of the inferior strait may present the same irregularities of inclination; indeed, the direction of both straits is most frequently changed at the same time.

But excepting some inconveniences which the woman suffers during gestation, that are more particularly dependent on the wrong direction of the uterus, whose displacement is often a consequence of the faulty direction of the axis of the superior strait, the puerperal functions are scarcely troubled by the anomaly mentioned; for although this abnormal direction of the pelvis has appeared in some few cases to present a serious obstacle to the delivery, it was only because it happened to coincide with a deformity of the bones and a contraction of the cavity. The facts reported by Moreau and Bello, when carefully examined, fully confirm the second part of this proposition, while the first is proved by the curious observations of M. Nægèle.

CHAPTER III.

OF BONY TUMORS OF THE PELVIS.

THE tumors that may obstruct the excavation take their origin in the bones or in the soft parts, and are extremely numerous and varied; and, where they have acquired a considerable volume, they constitute one of the most serious difficulties in the practice of midwifery. It will not be in our power, in this work, to enter into all the details which the importance of the subject demands; besides, all that relates to the etiology, the pathological anatomy, and the symptomatology of these tumors, rather belongs to surgery than to the obstetrical art; and we must confine ourselves more particularly to pointing out to the practitioner those signs by means of which their diagnosis is established, as also to bringing into view the different indications they present for treatment. It is proper to state at the outset, that, in compiling this article, we have freely extracted from the learned dissertation of M. Puchelt on the subject, whose classification we retain.

The tumors, whose influence over parturition is about to claim our attention, may have their origin either in the walls of the canal which the fœtus has to traverse, and therefore appertain to the soft parts or to the osseous parietes, or they may be a dependency of the neighboring organs.

Tumors of the soft parts will be studied hereafter. At present we shall treat of those bony tumors which occasion, in many respects, a resemblance to contractions of the pelvis.

§ 1. Exostosis.

If we lay aside, says M. Danyau, all those cases in which an unusual prominence of the sacro-vertebral angle has been mistaken for a true ossific tumor, as well as those where there is an uncertainty with regard to their character, from the insufficiency of the details in the written account, there positively remain but two examples of exostosis, the authenticity of which is incontestable, namely, those reported by Leydig and Mackibbin. Though some doubts may still exist as to the value of many assertions that have not been subsequently confirmed by the autopsy, yet I do not believe that we can thus strike out, by a dash of the pen, most of the observations recorded in our science. For example, it would really be difficult not to admit the authenticity of the one reported by Gardien, since Duret preserved the pelvis of the female who was the subject of it for a long time in his cabinet.

The facts reported by M. Puchelt prove that most pelvic exostoses arise from the anterior face of the sacrum. Nevertheless, several other points of the pelvis have likewise been their seat; thus they have been known to spring from the sacro-vertebral articulation, from the last lumbar vertebra, or the first bone of the sacrum, and from the posterior face of the pubis, either from its middle part, or on one of the sides, as also from the internal face of one of the ischia.

What has been stated respecting the uncertainty of the published observations, forewarns us of the difficulty that is at times experienced in diagnosticating the pelvic exostoses, and in distinguishing them from the various prominences caused by deformities of the pelvis. The hardness of the tumor, and its original adhesion to the osseous parietes, are given as characteristic signs; its unevenness and immobility are also important to be ascertained. Being always covered by the vaginal wall, it projects into the interior of this canal, by pressing aside the organs situated before it. When arising from the anterior face of the sacrum, it impinges on the posterior wall particularly; and, if the rectum be then explored, the latter will be found slightly pressed forward by the tumor, which is itself located behind. This last sign is very important, for nearly all the other tumors are situated in front of the bowel.

The prognosis is necessarily dependent on the size and situation of the tumor, and on the earlier or later period of gestation, at which the labor takes place. It is evidently more serious when the abnormal growth is very voluminous; when it is so placed as to diminish one of the small diameters of the straits, and when the child's head is very large.

The indications for treatment, which were so fully described in studying the deformities of the pelvis, present themselves anew, and demand the employment of the same means, namely: to abandon the labor to nature when the tumor is small and so situated as to shorten the long diameters only; or to apply the forceps, resort to symphyseotomy, to the Cæsarean operation, or to embryotomy, according to the degree of contraction. (See page 668 *et seq.*)

[§ 2. ENCHONDROMA.

Enchondromatous, or cartilaginous tumors of the pelvis, are quite rare. They were made the subject of an excellent paper published by our colleague and friend Dr. Dolbeau, (*Journal le Progres*, 1860,) which contains ten cases of enchondroma coincident with pregnancy, the one borrowed from d'Outrepont being given in the fullest detail. In this case, the tumor occupied the entire left half of the pelvis, was hard and globular, yet became so much softened during labor as to permit extraction of the child, which presented by the breech. In connection with Professor Depaul, I witnessed a case precisely similar to the one just mentioned; but as the patient recovered without ablation of the tumor, some doubts remain as to its real character.

These enchondromatous tumors seem to adhere to the bone or periosteum, either by a large surface or a slender pedicle; occasionally they are formed in the soft parts in the neighborhood only of the bony surfaces. They sometimes become quite large. (See *Le Traité Complémentaire des Accouchements* de Lenoir, Sée, et Tarnier. Paris, 1864.)

The indications to be fulfilled in such cases are the same as has been already laid down in respect to exostoses; (see above;) but the possible mobility of the cartilaginous tumors, and especially their softening, ought to modify favorably the prognosis in regard to the probable result of the labor. In extreme cases only is a bloody operation to be thought of.

§ 3. OSTEOSTEATOMA.

The term osteosteatomatous was applied by Lenoir to imperfectly defined tumors, composed of fibro-fatty and calcareous substances. He is, however, liable to the charge of having confused tumors of this character with enchondroma properly so called. Osteosteatomatous tumors always take their origin in the cellular tissue, and sometimes continue entirely free from any adherence with the bones of the pelvis, though most frequently they become attached to them. It is very difficult to establish a positive diagnosis between these tumors on the one hand and exostoses or enchondromatous tumors on the other. It is fortunate, therefore, that the conduct of the surgeon will be the same in either case.]

§ 4. OSTEO-SARCOMA.

Osteo-sarcoma of the pelvis is a very rare disease; two instances, however, are recorded, in which the contraction produced by it was extensive enough to require the Cæsarean operation.

The tumor can scarcely be distinguished from that of exostosis, unless, perhaps, by the inequalities it presents, and more particularly by the depressibility, the semi-cartilaginous softness, and the crepitation that it may offer at certain portions of its surface.

It is evident that this depressibility of the tumor will render the prognosis less serious than in cases of exostosis; since we may indulge a hope that the head being urged on by the uterine contractions, will flatten it down, and make it disappear in part. Consequently, it is here permissible to wait a longer time; but as soon as the inefficiency of the efforts of nature becomes apparent, we must resort at once to the same measures as in cases of pelvic contraction.

§ 5. BONY TUMORS CAUSED BY FRACTURES.

Ossific protuberances in the pelvis may likewise depend on the irregular consolidation of an old fracture in this part; or may be formed by the head of the femur, which, in consequence of coxalgia, has traversed the bottom of the carious and perforated acetabulum, and projects into the pelvic cavity. I recollect having read in a medical journal (which I cannot now find) an account of the Cæsarean operation having been performed in a case where the sole obstacle to delivery was thus formed by the head of the thigh-bone.

A representation of a fracture is given in the atlas of Professor Moreau, taken from the *Musée Depuytren*, in which the bottom of the right cotyloid cavity has been driven in, the internal wall forming a rounded tumor that projects nearly an inch and a half inwards; the ilium was at the same time divided beyond the right sacro-iliac symphysis; but, in consolidating, the exterior part of the iliac fossa has been carried inwards in such a manner as to approach towards the sacrum, whereby the tumor formed by the cotyloid wall is brought near to the sacro-vertebral angle.

The *Journal des Progrès*, t. xv. 1828, contains another curious instance of a fracture of the pelvis, with a consecutive deformity in the excavation followed by mortal symptoms; this woman had previously had five fortunate deliveries. The Cæsarean operation has frequently been performed for obstacles of this nature; thus Burns, Lever, and Barlow have each reported a case of the kind. A very full account of this subject will be found in *L'Atlas et le Traité d'Accouchement*, de Lenoir. Paris, 1864.

In conclusion, it is evident that, from whatever point the osseous tumors of the pelvis may arise, this cause of dystocia will still present the same indications for treatment.

CHAPTER IV.

EXCESSIVE RESISTANCE OF THE EXTERNAL GENITAL PARTS.

EVEN when the external genital parts appear to be perfectly well formed and the most thorough examination fails to detect a tumor or obstruction of any kind, cases sometimes occur in which they resist the passage of the child. These cases we propose studying in the present chapter.

§ 1. SMALLNESS AND RIGIDITY OF THE VULVA.

The rigidity of the external parts of generation, which is frequently observed in women who do not become pregnant until an advanced period of life, as also in very young, muscular girls, who are somewhat fat and of a plethoric habit, often causes a considerable delay in the progress of the head during the first labor. Most commonly, however, this narrowness and natural rigidity give way, and the parts become distended; but this distention is not always so complete as the volume of the head demands; and then the latter, being urged on by the violence of the uterine contractions, breaks down the resistance before it. and a laceration of the posterior vulvar commissure and of a more or less considerable portion of the perineum results. In certain cases, as elsewhere described, the contraction is vainly exerted for a long time against the resistance of the soft parts, and it becomes enfeebled or ceases altogether; the intervention of artificial measures is then indicated, at first to restore the contraction if possible, and afterwards to replace it by moderate tractions with the forceps.

In cases of this nature, where the labor had been abandoned for too long a time to the resources of the organism, the fourchette, being too firm to yield, has been known to remain intact; while the perineum, distended beyond measure, and thereby rendered thinner, was perforated at its centre, and the child expelled through an accidental opening, bounded in front by the posterior commissure of the vulva, and behind by the sphincter ani muscle. At the present day, this fact is *well* determined. But it may happen that the perineum is perforated at its middle, and yet, notwithstanding this accident, the fœtus pass out through the natural passage: this is particularly apt to occur when the accoucheur's hand, being forcibly applied on these parts, endeavors to press back the head in its normal direction, and thus replace the accustomed resistance of the pelvic floor. Therefore, it does not follow that the child has escaped through the central laceration of the perineum, simply because such an opening is met with after the delivery.

Even when every precaution is taken, there are, as we see, cases in which extreme smallness of the vulva, and rigidity of the soft parts, make it impossible for the head to be expelled without greater or less rupture of the perineum. In order to prevent it, Michaelis advised, in 1810, incision of the posterior commissure. The example of Eichelbery might, however, be followed, and the incision be made on one or both sides of the vulvar orifice. This operation should be performed only when the head is at the vulva, and rupture of the perineum seems imminent. The blade of Pott's bistoury is to be glided on its side between the head of the child and the margin of the vulva, and an effort made to limit the incision to the extent just necessary to allow the head to pass. Eichelbery mentions a rapid and safe cicatrization of the wound, in recommendation of this incision of the thickest part of the vulva.

[We therefore prefer lateral incisions: a single one may prove sufficient, but it is sometimes better to make them on both sides. The simplest way of doing it is by means of strong, blunt, pointed scissors, one of the blades of which is to be introduced flat between the head of the child and the vulva, to the distance of about three-eighths of an inch, and turned up when the incision is made.

The integuments are so distended when it becomes necessary to operate that very little pain is occasioned. The small wounds thus made are considerably shortened by the retraction of the vulva after delivery, and heal quickly. Incision of the edge of the vulva is, therefore, a very good operation, but slightly painful and devoid of danger, yet it ought not to be had recourse to unless really necessary.]

§ 2. Resistance of the Perineum.

It is not at all unusual, particularly in strong and muscular primiparæ, and in those possessing considerable embonpoint, to find the labor progressing very regular at first, the head clearing the cervix and descending into the excavation as far as the pelvic floor, and then its further progress to be entirely arrested; the uterus struggles energetically for a time against this obstacle, but, notwithstanding the force of its efforts, the head may remain there for several hours without advancing a single line. This resistance on the part of the perineum is evidently owing either to an excessive contraction of the muscular fibres that enter into its composition, or else to the presence of so great a quantity of adipose tissue, as to render this portion of the pelvic wall too inextensible to permit the escape of the head.

But whatever may be the cause of the resistance, it affects the ulterior course of the labor in two widely different ways, which it is highly important to distinguish in practice, for they require the employment of opposite means. For instance, it may happen that the uterine contraction, which was originally strong and energetic, is sustained in the same degree during several hours, but then, being overcome by the resistance which it cannot surmount, it grows weaker, is exhausted, and finally disappears altogether. The indications here are obvious; to endeavor to arouse the pains again, by making the patient walk about her chamber, by rubbing the abdomen or titillating the cervix uteri, and by administering the ergot: and, if all these prove ineffectual, to apply the forceps. But a very different case is occasionally met with, in which the contractions, so far from being exhausted, are kept up as strong and vigorous as at the commencement of the labor; and yet, notwithstanding their energy, they are incapable of effecting the dilatation of the soft parts in the perineum; this proving an insurmountable resistance against which the most powerful efforts are spent in vain. Here the accoucheur should evidently avoid the use of means calculated to arouse the contractions,—the ergot in particular would be exceedingly dangerous,—since the tetanic and irregular contractions that result from its use, and which have so often been followed by the death of the child, and even by a rupture of the womb that has almost uniformly proved fatal to the mother, are then particularly apt to occur. The uterus is certainly doing all that it can, and the physician should not attempt to arouse any more energetic contractions, but should rather aid its expulsive efforts by tractions carefully performed on the child; and an application of the forceps is clearly the only resource. Our view of its particular mode of action in the case before us will be studied hereafter in the article on *Forceps*.

Now, in order to illustrate this distinction, which we believe very important in practice, we will suppose two women in labor, in both of whom the child's head is properly situated, and has rested on the pelvic floor for six or seven hours; but in one of them, the contractions, that were at first strong and frequent, have gradually become more feeble and rare, or even have almost entirely disappeared; while in the other, on the contrary, they still maintain all their original power. In the latter case, we would apply the forceps immediately; whilst in the former, we should first have recourse to the various measures calculated to restore the pains, and we would only resort to the forceps when these excitations had proved ineffectual, or the pains caused by the ergot still appeared to be insufficient.

It is also important to remember that the life of the fœtus may be greatly endangered by the ergotic contractions. These, therefore, should not be allowed to continue too long. If the head is not expelled after the lapse of half or three quarters of an hour from the commencement of the ergotic contractions, I should think it prudent to terminate the labor by the forceps.

This inefficiency of the pains brought on by the ergot is not very unusual in the case before us; but, even then, the administration of this article will have been useful, though an application of the forceps be afterwards deemed necessary; because the instrument will then be applied under much more favorable conditions; for the contractions produced by the secale cornutum will aid the artificial tractions; and, moreover, will prevent the consecutive inertia of the womb, to which the woman would have been exposed, if the instrument had been applied without previously exciting its contractility of tissue.

§ 3. Laceration or Rupture of the Perineum.

[Smallness of the vulva and resistance of the perineum are not unfrequently the cause of laceration of the fourchette and of the perineum itself, to a greater or less extent. These lacerations may be either incomplete, central, or complete. They are *incomplete* when, beginning from the vulva they do not involve the sphincter of the anus; *central*, when the rupture occurs between the vulva and anus, without involving either of these openings; *complete*, when the vulva, perineum, and sphincter ani are torn, together with the recto-vaginal partition, to a greater or less height.

Incomplete lacerations do not require any particular treatment, as they heal spontaneously. The lower limbs ought, however, to be kept together by means of a napkin tied around the knees. Cicatrization sometimes takes place by first intention, and sometimes after suppuration. In either case, the perineum will almost always be sufficiently large after recovery. In cases of incomplete rupture extending to the sphincter of the anus, a few points of suture or "serre-fines" have often been used; but, for our own part, we gave them both up long ago, because they are painful and liable to give rise to small points of gangrene. In all cases of incomplete laceration, I think it best to abstain from operations of every kind. A few touches with nitrate of silver will be all that is necessary.

What has just been said of incomplete lacerations applies equally to the treatment of the central ruptures.

Complete lacerations are far more serious than the preceding, being often followed by inability to retain the fæces, which is a deplorable infirmity. It is well, however, to know that a certain number of these cases of complete rupture recover spontaneously. This occurred in one case under my own observation; and as M. Huguier has seen fifteen or twenty which terminated in the same way, the natural cure cannot be a very rare occurrence. Nevertheless, spontaneous recoveries are far from being the general rule, and then surgical interference becomes a matter of necessity. When perineoraphy is to be performed, the question arises as to the best time for doing the operation. Dieffenbach advises the suture immediately after delivery, for as at that time the lacerated edges are still bleeding, it is unnecessary to freshen them, and the whole is resolved rather into a simple dressing than a bloody operation. Still, this course has its inconveniences, for the patients are deprived of the chance of a spontaneous cure, the lochial discharges impede cicatrization, and the diseases to which the puerperal state is so liable, often prevent a successful issue. I think it much better, as advised by Roux and Velpeau, to wait until the patient has entirely recovered, and defer operating until after the first menstrual return.

M. Nélaton advised that it should be done seven or eight days after delivery, and without freshening the edges, merely to bring together the edges of the wound, at this time covered with granulations. This method has had both its successes and failures. At seven or eight days after delivery the genital parts are often still swollen, so that the sutures then traverse inflamed tissues, which cut through readily. Lochial discharges and intercurrent puerperal diseases are, besides, liable to interfere with the recovery.

We therefore give preference to the later operation.]

CHAPTER V.

OF MALFORMATIONS OF THE VULVA AND VAGINA.

THE malformations of the genital parts may be either congenital or accidental; but, as both offer very similar indications for treatment, I shall include them in the same description.

§1. ADHESION OF THE GREATER AND THE LESSER LABIA.

This may exist at birth, or it may result from some wound or ulceration, the healing up of which has not been properly attended to. Denman has remarked that this abnormal union is quite frequent in little girls, though it is rarely observed at the age of puberty, as the free and constant use made of their limbs, when they begin to walk, most probably causes a spontaneous separation. This union, when congenital, may be more or less complete, intimate, or resistant. When resulting from an accident, it is never perfect, because the frequent passage of the urine prevents adhesion from taking place at the point corresponding to the meatus urinarius; and the discharge of the menstrual fluid, when the courses come on before the cicatrization is completed, likewise prevents the adhesion of the labia for a considerable extent.

§ 2. PERSISTENCE OF THE HYMEN.

The hymen may occasionally persist even after copulation, and thus constitute an obstacle to the expulsion of the child. The varieties of form it may exhibit under such circumstances were pointed out in the anatomical description of this membrane. A persistence of the hymen does not always prevent conception, since most authors relate instances in which they were obliged to divide it at the time of labor in order to make a free passage for the child. They have even detailed examples of pregnant women, in whom a second hymen was found some distance above the first. Again, this membrane has persisted after the delivery, as proved in a case observed by Meckel, Sen., and reported by Tolberg. A woman, after having expelled a fœtus of five months, surrounded by all its membranes, still preserved her hymen intact, circular, and tense.

§ 3. OBSTRUCTION FROM CICATRICES.

The smallness and rigidity of the external parts may be occasioned either by abnormal bands or unyielding and inextensible cicatrices resulting from wounds, or more commonly from the lacerations which are liable to occur in tedious or difficult labors.

Cases of this kind are not uncommon. De la Motte mentions one which is quite remarkable. Auguste Berard relates in the *Dictionary* in 30 volumes, a case in which after the operation of perineoraphy the vulva was so contracted as to render sexual intercourse impossible. In Vol. V. of the *Gazette Médicale* (April, 1837, p. 13) is reported a case of difficult labor due to an operation of episioraphy. All cases of this kind resemble each other, and the course of the accoucheur, under the circumstances, is very simple: a few incisions, and, if necessary, the use of the forceps, accomplish the delivery.[1]

It must not be supposed that all women, in whom the fourchette had been destroyed in a former labor, and in whom the band resulting from the cicatrix had constituted the obstacle to delivery, are as fortunate as she whose history I have just given; for sometimes a fresh laceration has occurred, and at others the resisting band has not yielded, and the child has been expelled through a central rupture of the perineum.

---

[1] To the numerous examples recorded in the books, I may add the following from my own experience: In the beginning of January, 1838, while I performed the duties of Chef de Clinique at the hospital of the Faculté, a woman of about thirty years of age was brought there, who was pregnant for the second time, and had reached her full term. She had been in labor since the previous Friday evening, and it was then Sunday morning. The patient informed us that the membranes were ruptured on Saturday at eight A. M., and that the head appeared to descend rapidly in the excavation, but was arrested in the passage. The accoucheur in attendance called one of his brethren in consultation, and they attempted an application of the forceps at two o'clock in the afternoon, without any benefit. At eight in the evening, everything being in the same condition, they renewed the use of the instrument, which still proved ineffectual. They then waited until Sunday morning, and had the patient transported to the hospital. As Professor P. Dubois was absent on her arrival, I examined the woman, and found that the head had entered the excavation and was resting on the floor of the pelvis, the inferior strait of which appeared to be slightly contracted. A transverse band, about the thickness of a large goose-quill, and composed of a very hard and apparently cartilaginous tissue, existed at the posterior commissure of the vulva. (The woman then told us that her former labor could not be terminated without resorting to the forceps, and that a considerable laceration of the perineum had resulted in consequence of its use.) At every contraction, which, however, was feeble and infrequent, the child's head pressed strongly against this bridle, but the latter did not yield in the least; and for two hours, during which we watched the progress of the labor before taking any part, the head did not advance a single line; besides, the vulva did not dilate, and the band remained as hard, resistant, and inelastic as ever. I was about to make an incision on the anterior commissure of the perineum; but a new examination of the parts having satisfied me that the lower strait was somewhat contracted, that the pains were very feeble, and consequently that the head's arrest might be dependent on these two circumstances, as well as upon the resistance of the band, I resolved to attempt a new application of the forceps. The head was then in an occipito-pubic position, or nearly so, though the occiput was still a little to the left; the blades were applied and locked without difficulty, but the first tractive efforts proved to be wholly abortive; after trying for a quarter of an hour, I succeeded in fairly engaging the head in the osseous strait; the posterior part of the perineum began to bulge out, though the commissure still resisted, and the pressure thus made on the soft parts seemed to arouse the uterine contractions, for the woman, from that moment, aided my efforts with all her powers. Under the conjoint influence of these two forces, the head constrained the vulva to dilate, the band gradually yielded, it became thinner and more distended, and finally, after three-quarters of an hour of constant tractions and almost continual pains, the head succeeded in clearing the vulva. The perineum was well sustained by an assistant, and did not exhibit the smallest trace of a laceration.

§ 4. MALFORMATIONS OF THE VAGINA.

The entire vagina, or only its upper part, may be wanting, as in the case mentioned (page 108), in which only the lower fourth of the canal was present. This kind of deformity is often coincident with absence of the uterus, in which case it is plain that the accoucheur has nothing to do.

It may be entirely or partially obliterated at some one point, either by partial or complete adhesion of its walls, or by partitions. The adhesion may be congenital, and the vagina reduced to a dense, solid, impervious cord, composed of mere cellular tissue; or it may be accidental, resulting most usually from lacerations or lesions during former labors, or else from wounds or injuries. Thus, in the case of a woman, reported by M. Lombart, of Geneva, who used a pint of sulphuric acid as an injection, with the culpable design of procuring an abortion, the bladder was found to be fused immediately into the rectum, the vagina having been destroyed at the corresponding part; and M. Cruveilhier has known the vulvo-uterine canal to terminate in a cul-de-sac, about an inch from the meatus urinarius, in consequence of vaginal injections made with a solution of corrosive sublimate.

The partitions spoken of as existing in the vagina may be transverse or longitudinal; and most of the cases of double or triple hymen mentioned by authors can probably be referred to the former. These may be complete, that is, they may divide this canal into two distinct cavities, though more frequently they exhibit a small opening through which the liquids ooze;[1] or incomplete, only obliterating it in part; consequently their form is very variable in different cases.

[A very singular case of dystocia, caused by a sort of bridle in the vagina, was reported to me by my friend Dr. Pignant, of Creuzot. When the child was about to be expelled, the head passed above a sort of bridle or bridge, whilst the body was disengaged below it, so that the neck of the child remained applied against the vulva, retained there by the bridle. The midwife in attendance would not venture to cut the constricting part, which was rounded in form, muscular in appearance, and as thick as the little finger. The child perished in consequence. Upon examination, the bridle was found to have a longitudinal direction, with its two ends inserted upon the vagina.]

---

[1] In the course of the year 1837, a young woman, who was advanced to the last month of gestation, presented herself at the clinic of the Faculté. When the vaginal touch was resorted to, the finger was arrested, at the depth of one inch and a half or two inches, by a perfectly smooth septum, in which it could detect no sensible opening. By a resort to the speculum, it became evident that the obstacle to the entrance of the finger consisted of a membrane, which adhered to the walls of the vagina, and completely blocked up its cavity at this point. Its surface appeared to be nearly an inch in diameter; and, by pushing and distending it with the extremity of the instrument, a small opening was detected towards the upper third and right portion of this partition, through which a few drops of sero-purulent liquid were oozing.

The extremity of a blunt probe could scarcely be made to penetrate the little orifice, which was directed obliquely from below upwards, and from before backwards; the instrument then entered a kind of posterior chamber, formed by the upper wall of the vagina. Thus far, no accident had impeded the course of the gestation, but some difficulty was thenceforth anticipated at the time of labor. This patient was taken during the night with pains, but they were so feeble that a commencement of the labor was not suspected; though about five o'clock in the morning very strong and frequent ones came on, which effected the expulsion of the fœtus. The lying-in was very favorable, and two weeks afterwards I found that the septum had been split into three distinct pieces; one inferior and two superior. I have examined this woman several times since, and am satisfied that the flaps still remain isolated.

Where the septa are longitudinal, at times they only divide the vagina in a part of its extent; but at others, they separate it throughout. In the latter case, the continuity of the partition may be interrupted at some part, and then the two canals which it forms will communicate through this opening. The septum, when complete, is occasionally prolonged into the uterus, which it likewise divides into two cavities, although this does not always happen.

The vagina may have been originally very small, or it may have undergone a remarkable diminution or contraction. This, in some cases, has been carried so far as scarcely to permit the introduction of the female catheter. M. Moreau observed a young woman in the fourth or fifth month of her pregnancy, in whom this canal was so contracted that it barely admitted the barrel of an ordinary writing-quill. Such a disposition, which gives rise to much uneasiness, nearly always yields to the natural progress of the gestation.[1]

Again, the vulvo-uterine canal may be deviated from its usual course, and present no natural openings at the parts of generation. The points at which it then terminates are very various; thus it has been known to open below the navel by two small orifices, separated from each other by a strong membrane, one of which gave passage to the urine, and the other to the menstrual fluids; frequently, it discharges into the rectum. Portal states that a young girl, in whose vulva there was only a small opening for the passage of the urine, and whose menses were always discharged by the anus, became pregnant; yet the small opening enlarged sufficiently during the latter stages of gestation, and more particularly during the travail, to permit a spontaneous termination of the labor. M. Rossi reports that, having been called to a woman in labor, he discovered a total absence of the external genital organs. At first, he supposed there was a retention of the menses, and, under this impression, made an incision about two inches long in the direction of the vagina; when, instead of the menstrual blood, he encountered a male child, which escaped through this opening, and lived but seven hours after its birth. Whilst searching where the fecundation could have taken place, he discovered, after having interrogated the husband, a small orifice, near the sphincter ani and at the internal part, which would scarcely admit a fine probe.

[1] Plenck states that, being summoned to a woman in labor, he found the vagina so contracted that the little finger could not be introduced at all. Nevertheless, this canal was sufficiently dilated by the end of eighteen hours, and the child's expulsion took place without producing any laceration of it or of the external genital parts. (*Elementa artis Obstetriciæ*, p. 113.)

Merriman states that the labor terminated spontaneously in thirty-six hours, in a case where the introduction of the finger was barely possible; but the patient died on the third day, and a small laceration of the vagina was found at the *post-mortem* examination. (*Synopsis*, p. 59.)

The various obstacles just studied are most frequently surmounted by the efforts of nature alone; and, therefore, as a general rule, there is no necessity for an early resort to cutting instruments. If, however, it be deemed advisable to have recourse to an operation before the labor, for separating the agglutinated parts, incising the hymen, or for destroying an abnormal septum or vaginal adhesion, it would be better to wait until the first four or five months of the gestation have passed over; because, after this period, there would be less reason to fear the unfavorable influence which the shock caused by the operation might have over its progress. As the hymen and the vaginal septum are nearly always perforated by an opening, a director might be introduced into it, along which a bistoury should be passed, so as to incise the parts; where it is necessary to divide the adherent labia, we might use the scissors, as their agglutination is always incomplete; but, in all cases, the incision must be carried as low down as possible, so as to open a free passage for the lochia. When it is desirable to destroy the hymen or a septum, it is usually recommended to make a crucial incision, and even to excise the flaps to prevent them from afterwards reuniting. A similar plan would be resorted to, at the time of parturition, excepting that the same importance does not attach to the excision of the flaps, as the discharges of the lochia would prevent their reunion.

As to the bands and partial contractions found at some part or other of the canal, we should delay our operation, for they most generally become softened and ultimately permit the delivery to take place; in the contrary case, they must evidently be incised.

Finally, an accidental and complete obliteration of the vulva, occurring during the course of gestation, would require the creation of a new passage for the head, as soon as the latter distends the perineum; and it is advisable to make the incision in the place usually occupied by the vulvar orifice.

§ 5. INVERSION OF THE VAGINA.

Inversion of the vagina occasionally takes place during parturition; that is, the mucous membrane of this canal being pressed down by the child's head, and consequently being more or less inverted, forms a livid and fungous cushion of considerable size between the labia, or beyond the vulva, which opposes the passage of the head. The pressure made by this part on the inverted membrane, often gives rise to gangrene; and, therefore, with a view of preventing this unfortunate result, the forceps ought to be applied at once. The causes that predispose the patient to an inversion of the vagina are: a long and difficult labor, a large head, and a marked relaxation of the mucous membrane. If this affection is detected before the head is engaged, the accident might be prevented by pushing up the membrane at the commencement of the labor, and maintaining it there until its close.

CHAPTER VI.

TUMORS OF THE VULVA AND VAGINA.

THE vulva and vagina are liable to be affected with a variety of tumors, of which we shall have to notice, œdema of the labia externa, thrombus of the vulva and vagina, cysts, abscesses, fibrous tumors pediculated or otherwise, cancerous degenerations, and all the vegetations.

§ 1. ŒDEMA OF THE LABIA EXTERNA.

The œdema of the greater labia, already alluded to, when treating of the complications of pregnancy, is sometimes so considerable at the time of labor as to obliterate the entrance of the vagina almost completely; and, by opposing the necessary distention of the vulva, it may render the parturition very difficult, as well as exceedingly painful. The child's head may produce a gangrene in the parts thus tumefied, by the pressure on them during its passage, or, at least, it may cause an extensive rupture. These accidents are to be prevented by making punctures with the lancet in all the swollen tissues; the number of the punctures will necessarily vary with the extent of the swollen parts, and the degree of their engorgement.

[Œdema of the entire soft parts of the cavity of the pelvis, especially in women who have naturally much embonpoint, occasions a sort of constriction of the genital passages which obstructs natural delivery, and embarrasses much the operator when he finds it necessary to interfere. Although this is quite a rare cause of dystocia, it nevertheless happens; indeed, quite recently, at the Hospital St. Antoine, it rendered delivery very difficult in the case of a woman attacked with convulsions, although she was very well formed.

§ 2. SANGUINEOUS TUMORS, OR THROMBUS.

Thrombus of the vulva and vagina consists in an effusion of blood in the soft parts of the lesser pelvis or of the vulva. It sometimes extends above the superior strait, and even quite high into the abdomen. Thrombus, therefore, is a true hemorrhage, and on this account there might be some advantage in describing it in connection with the other losses of blood which are liable to complicate labor, were it not that the causes which produce it, the tumor which it commonly forms in the vagina, and the treatment which it requires, distinguish it so clearly from uterine hemorrhage that it has seemed more proper to classify it with the tumors of the vulva and vagina. The very name of the affection also justifies the position which we assign to it.]

The tissue that constitutes the lips of the vulva, and lines the entrance of the vagina, is composed of venules, arterioles, cellular filaments, and fatty masses, so interlaced and held together, that an effusion of blood there is almost always abundant; besides which, the stagnation of the fluids in the external genital parts, and the varicose state of the vaginal veins, so frequent in pregnant women, predispose all these organs to what is denominated thrombus. In fact, during gestation, and more particularly in the course of its latter months, these large veins are apt to give way, either spontaneously, or in consequence of some external violence, and the blood is extravasated into the cellular tissue, whereby a considerable tumor is developed; and, in the course of a variable period, gangrene attacks the distended parts, and hemorrhage, which is occasionally very profuse and sometimes even fatal, takes place.[1]

Thrombus of the vulva does not appertain to pregnant women exclusively, since it may also appear in the non-gravid condition; indeed, according to Velpeau, it is even more frequent then than during gestation. However, it must be acknowledged that the obstruction to the circulation in the lower extremities caused by the development of the womb, must necessarily favor the production of this tumor; and, consequently, that, in the non-pregnant state, a thrombus of the vulva is far less dangerous than in the opposite condition.

This tumefaction most generally affects the great labia, though it has also been observed in the lesser; in most cases a single lip only is involved, though at times there is a double tumor, caused by a simultaneous effusion into both of the labia externa. Wherefore, Boër was wrong in supposing that the right one was its exclusive seat, for it may appear indifferently on either side.

It is rarely present in the earlier months of gestation, but is more frequent in the latter periods, and particularly so during the labor, or after the delivery. The most common cause of thrombus during pregnancy, are blows, falls, violent concussions, etc., etc. In some cases it can be traced to no external violence, and then the spontaneous rupture must evidently be referred to an excessive distention of one of the vaginal veins. When occurring during labor, this affection is nearly always manifested just as the head or breech endeavors to clear the vulva, after having reached the inferior strait. The rupture of the veins is then certainly caused by the distention, which they, like all other parts, are subjected to, (a distention to which they yield with more difficulty,) and by the great accumulation of blood produced by the obstruction to the circulation from the presence of the child's head. Therefore, an excessive size of the latter, or its unusual delay at the inferior strait, a narrowing of the pelvis, and the consequent immoderate efforts on the part of the patient to overcome the resistance, are its most common causes. Certain authors have likewise supposed that the obliquities of the womb, and the frequent rough examinations of the parts of generation, might produce them; but it is evident that such circumstances cannot have the attributed effect, unless a varicose predisposition exists at the same time. Ordinarily, these tumors only appear after the delivery, when, indeed, they are the more dangerous; first, because they may the more readily escape unperceived, and then, because the relaxation of the parts permits them to acquire a very considerable volume.

The remark of M. Deneux should be borne in mind, that most of the cases of thrombus which are not detected until after delivery, really commence during the labor, or, at least, that the rupture of the vessels, if not the effusion, takes place during the first expulsive pains. Often, indeed, when a

---

[1] This accident was described quite accurately, in 1647, by Veslingius. "I have twice," says he, "witnessed an effusion of blood between the vaginal tunics, in cases of difficult labor. The labia presented a considerable tumor, which, when opened, discharged quite a large amount of blood."

CHAPTER VI.

TUMORS OF THE VULVA AND VAGINA.

THE vulva and vagina are liable to be affected with a variety of tumors, of which we shall have to notice, œdema of the labia externa, thrombus of the vulva and vagina, cysts, abscesses, fibrous tumors pediculated or otherwise, cancerous degenerations, and all the vegetations.

§ 1. ŒDEMA OF THE LABIA EXTERNA.

The œdema of the greater labia, already alluded to, when treating of the complications of pregnancy, is sometimes so considerable at the time of labor as to obliterate the entrance of the vagina almost completely; and, by opposing the necessary distention of the vulva, it may render the parturition very difficult, as well as exceedingly painful. The child's head may produce a gangrene in the parts thus tumefied, by the pressure on them during its passage, or, at least, it may cause an extensive rupture. These accidents are to be prevented by making punctures with the lancet in all the swollen tissues; the number of the punctures will necessarily vary with the extent of the swollen parts, and the degree of their engorgement.

[Œdema of the entire soft parts of the cavity of the pelvis, especially in women who have naturally much embonpoint, occasions a sort of constriction of the genital passages which obstructs natural delivery, and embarrasses much the operator when he finds it necessary to interfere. Although this is quite a rare cause of dystocia, it nevertheless happens; indeed, quite recently, at the Hospital St. Antoine, it rendered delivery very difficult in the case of a woman attacked with convulsions, although she was very well formed.

§ 2. SANGUINEOUS TUMORS, OR THROMBUS.

Thrombus of the vulva and vagina consists in an effusion of blood in the soft parts of the lesser pelvis or of the vulva. It sometimes extends above the superior strait, and even quite high into the abdomen. Thrombus, therefore, is a true hemorrhage, and on this account there might be some advantage in describing it in connection with the other losses of blood which are liable to complicate labor, were it not that the causes which produce it, the tumor which it commonly forms in the vagina, and the treatment which it requires, distinguish it so clearly from uterine hemorrhage that it has seemed more proper to classify it with the tumors of the vulva and vagina. The very name of the affection also justifies the position which we assign to it.]

The tissue that constitutes the lips of the vulva, and lines the entrance of the vagina, is composed of venules, arterioles, cellular filaments, and fatty masses, so interlaced and held together, that an effusion of blood there is almost always abundant; besides which, the stagnation of the fluids in the external genital parts, and the varicose state of the vaginal veins, so frequent in pregnant women, predispose all these organs to what is denominated thrombus. In fact, during gestation, and more particularly in the course of its latter months, these large veins are apt to give way, either spontaneously, or in consequence of some external violence, and the blood is extravasated into the cellular tissue, whereby a considerable tumor is developed; and, in the course of a variable period, gangrene attacks the distended parts, and hemorrhage, which is occasionally very profuse and sometimes even fatal, takes place.[1]

Thrombus of the vulva does not appertain to pregnant women exclusively, since it may also appear in the non-gravid condition; indeed, according to Velpeau, it is even more frequent then than during gestation. However, it must be acknowledged that the obstruction to the circulation in the lower extremities caused by the development of the womb, must necessarily favor the production of this tumor; and, consequently, that, in the non-pregnant state, a thrombus of the vulva is far less dangerous than in the opposite condition.

This tumefaction most generally affects the great labia, though it has also been observed in the lesser; in most cases a single lip only is involved, though at times there is a double tumor, caused by a simultaneous effusion into both of the labia externa. Wherefore, Boër was wrong in supposing that the right one was its exclusive seat, for it may appear indifferently on either side.

It is rarely present in the earlier months of gestation, but is more frequent in the latter periods, and particularly so during the labor, or after the delivery. The most common cause of thrombus during pregnancy, are blows, falls, violent concussions, etc., etc. In some cases it can be traced to no external violence, and then the spontaneous rupture must evidently be referred to an excessive distention of one of the vaginal veins. When occurring during labor, this affection is nearly always manifested just as the head or breech endeavors to clear the vulva, after having reached the inferior strait. The rupture of the veins is then certainly caused by the distention, which they, like all other parts, are subjected to, (a distention to which they yield with more difficulty,) and by the great accumulation of blood produced by the obstruction to the circulation from the presence of the child's head. Therefore, an excessive size of the latter, or its unusual delay at the inferior strait, a narrowing of the pelvis, and the consequent immoderate efforts on the part of the patient to overcome the resistance, are its most common causes. Certain authors have likewise supposed that the obliquities of the womb, and the frequent rough examinations of the parts of generation, might produce them; but it is evident that such circumstances cannot have the attributed effect, unless a varicose predisposition exists at the same time. Ordinarily, these tumors only appear after the delivery, when, indeed, they are the more dangerous; first, because they may the more readily escape unperceived, and then, because the relaxation of the parts permits them to acquire a very considerable volume.

The remark of M. Deneux should be borne in mind, that most of the cases of thrombus which are not detected until after delivery, really commence during the labor, or, at least, that the rupture of the vessels, if not the effusion, takes place during the first expulsive pains. Often, indeed, when a vein is ruptured, it is so compressed by the head in the excavation as to prevent any effusion, a free escape of blood taking place only after the labor is terminated. It being rarely necessary to introduce the hand into the vagina after the delivery of the placenta, the tumor will not be discovered until it has become so large as to incommode the patient, or the physician is alarmed by the general symptoms of hemorrhage. Therefore, considerable time may elapse between the commencement of the accident and its detection.

---

[1] This accident was described quite accurately, in 1647, by Veslingius. "I have twice," says he, "witnessed an effusion of blood between the vaginal tunics, in cases of difficult labor. The labia presented a considerable tumor, which, when opened, discharged quite a large amount of blood."

Still another condition may postpone the appearance of the thrombus, namely, the stoppage of the small opening in the vein by a coagulum.

Finally, it may happen, as supposed by M. Dubois, that the badly contused, and perhaps even mortified walls of the vessels, do not give way until when, at a later period, the part which has suffered the pressure becomes detached. The mucous membrane, being more extensible than the walls of the veins, recedes, so to speak, before the violence which affects the distended vessel, and is not, therefore, so much injured by it. Thus is explained the late effusion of the blood into the submucous cellular tissue, and the consequent formation of a tumor.

[M. Perret (*Paris Thesis*, 1864) maintains, moreover, that the head of the child may occasion a sort of sliding of the walls of the vagina upon the surrounding tissues, and terminate in the detachment of the walls for a greater or less extent, with rupture of the cellular partitions. Thus is formed a cavity of variable size, which may become filled with blood from the ruptured capillary vessels. In support of his opinion, M. Perret refers to an autopsy, in which he saw the water of an injection, thrown into the femoral vein, make its appearance over the entire surface of the cavity; from which he concluded that no important vein had been injured.]

It is highly probable that the thrombus which forms during labor is occasioned by the rupture of one or more veins, and the same is true for that which makes its appearance after delivery; only, in this case, the effusion does not occur until after the child is born. We can imagine, however, that the phenomena may take place differently; for, as the walls of the veins are often very much weakened, either by extreme distention or the stretching to which they are subjected during the labor, it is possible that a sudden movement, a violent inspiratory effort, or a fit of coughing, might suddenly cause such an afflux of fluid into them, as to produce their spontaneous rupture even after the lapse of several hours from delivery.

The development of a sanguineous tumor is generally announced by a severe pain in the affected part, caused, doubtless, by the rupture of some of its vessels; then one, or sometimes both of the greater labia, or, perhaps, only the nymphæ, soon swells up, becomes rapidly distended, and forms a more or less voluminous tumor. This tumor may acquire a considerable size, and the quantity of effused blood be great enough to debilitate the patient, and, possibly, to produce syncope. In some instances, it acquires its full volume at once, while in others it goes on augmenting for twenty-four hours; it may be limited to the external parts, or it may extend deeply into the pelvis, and, possibly, as far as the iliac fossæ.

In a paper published in 1860 on the seat of thrombus, M. Laborie h his classification upon an account of the aponeuroses of the perineum, and makes the following varieties:

1. Superficial thrombus, which may spread to a great distance beneath the skin, extending back near to the anus, upward in front to the abdominal parietes, and laterally to the gluteal region.

2. Thrombus situated between the superficial and middle aponeuroses, and limited to the confines in which it occurred.

3. Thrombus situated between the middle and superior aponeuroses; it is always very small.

4. Thrombus between the superior perineal and the pelvic aponeuroses. In this variety, the blood may make its way to a great distance, reaching, laterally, into the iliac fossæ, and backward to the sacrum, and even to the lumbar region.

5. Thrombus above the pelvic aponeurosis. Here the effusion takes place into the sub-peritoneal cellular tissue, and may invade the entire pelvis, the broad ligaments, and ascend in the substance of the mesentery as far as to the diaphragm.

6. Finally, he describes, as a sixth variety, an effusion of blood in the tissue of the vaginal wall itself, without rupture of the fibrous tunic. In this case, the effusion dissects the vagina, and presses it inward.

All these divisions are rather anatomical than clinical, but we reproduce them, in order to show clearly how very variable the seat of thrombus may be.

In 1846, I had occasion to witness a case in which the effusion had spread very widely. The autopsy revealed a layer of coagulated blood between the muscles and peritoneum, spread over the whole lower half of the anterior walls of the abdomen on the right side. The layer was nearly a quarter of an inch thick, and extended from below upward to about two fingers' breadth below the umbilicus, besides occupying transversely the entire space between the linea alba and the crest of the ilium.

At the latter point, the layer of blood was continuous with a clot about three-eighths of an inch thick, also situated beneath the peritoneum, and lining the entire iliac fossa. Below and inward, it turned over the edge of the superior strait, and was lost in a large collection of coagulated blood, which formed the tumor that during life had especially attracted our attention. The clot in this place was at least five-eighths of an inch thick at the centre, but it grew thinner as it spread out over the entire right side of the excavation: the remaining cellular tissue of the pelvis was highly colored by infiltrated blood.

The disaster was not, however, limited to what we have described, for in ascending, and separating the peritoneum upon the posterior and right lateral side of the abdomen, the coagulated blood was found to extend as far as the right hypochondrium, and to imbue the entire cellular tissue surrounding the kidney; it also passed between the folds of the peritoneum forming the origin of the mesentery, and finally extended to the attachments of the diaphragm to the false ribs of the right side, which connections seemed to have been the only barrier to its further progress. The thickness of this large c[illegible] varied from one to two-eighths of an inch. The total amount of effused blood was estimated at two pounds by those who witnessed the autopsy.[1]

Again: it not unfrequently happens that the effusion commences within the pelvis, and subsequently approaches the exterior. The tumor shortly assumes a violet or livid hue; and when the thrombus is seated high up, this discoloration of the skin rarely permits it to be mistaken; when lower, and in the substance of the greater labia, on the contrary, it may neither be accompanied by ecchymosis, pulsation, nor throbbing. Where the blood infiltrates into the meshes of the cellular tissue only, the tumor is hard; but it becomes soft and fluctuating when this texture is torn, and there is an abnormal cavity formed. Again, it is not unusual for the skin, or mucous membrane covering it, to give way in consequence of being gradually rendered thinner; thereby giving vent to a considerable discharge of blood, with an instantaneous cessation of the pain; and this hemorrhage may be so profuse as to speedily terminate in death, especially if the tumor be voluminous, and the rupture occurs during the efforts of parturition. Cases have been known in which the rupture was followed by a projection of a jet of blood with such force and abundance, as to fall at a distance of several feet from the patient, and to be mistaken by the attendants for a rupture of the membranes, and discharge of a large amount of water. Whenever the nature of the accident was mistaken and the proper measures were not employed, the patient succumbed in a few minutes.

A copious bleeding has occasionally taken place during the formation of a thrombus. In fact, this circumstance may occur whenever the mucous membrane and one or more of the veins are lacerated at the same time. Should the two openings not correspond with each other, one part of the blood will escape into the vagina, and the other be infiltrated into the cellular tissue.

Where the thrombus has acquired a considerable size, it may evidently impede the passage of the head, and after the delivery, that of the placenta and lochia.

Madame Lachapelle relates a very curious instance, in which a thrombus, that had first commenced during the labor, underwent a rapid development after the child's expulsion. The tumor obstructed the vagina so much, that it prevented the escape of the lochia, whence the latter accumulated in the womb, and became, somewhat later, the source of a profuse hemorrhage. Fortunately, she continues, in the attempts to introduce my hand into the uterus, for the purpose of extracting the clotted blood, I ruptured the tumor involuntarily, near the entrance of the vagina, when a large quantity of coagulated blood immediately escaped, its size diminished, and all the attendant symptoms disappeared without any particular treatment.

Finally, the pressure of the tumor on the neck of the bladder may cause retention of the urine and fecal matters.

When the thrombus appears early in pregnancy and has been emptied by incision and the patient cured, it may reappear some time after and at the same place. A relapse of the kind is reported by Montgomery. The tumor, which showed itself in the left labium in the seventh month of gestation, caused so much pain as to induce the author to puncture and empty it on the 18th of June. He was sent for again on the 13th of July, and discovered a much larger tumor than the preceding, and was again obliged to puncture it in order to relieve the patient. It did not return until the 24th of August, at which time the young woman was delivered.

---

[1] For the details of this case, see the *Gazette Medico-Chirurgicale* (February 28, 1846).

The diagnosis of these tumors is, in general, quite easy; for their sudden appearance, their rapid development, their hardness when the blood is simply infiltrated, and fluctuation when it is collected in an abscess; the violent pains they give rise to, and the bluish discoloration of the skin, are always sufficient to detect them. Nevertheless, they have sometimes been confounded with certain other tumefactions, such as the simple varicose ones, an inversion of the vagina, the descent or inversion of the womb, and with the vaginal herniæ formed either by the intestine, the omentum, or the bladder; but as we shall have occasion hereafter to treat of each of these tumors, and their peculiar signs, it seems useless to enter here into their differential diagnosis.

The prognosis is usually unfavorable; thus, "in sixty-two cases brought to my knowledge," says M. Deneux, "the mother died in twenty-two of them, either during the gestation, or else during or after delivery; and with the exception of a single instance, all the children of these twenty-two females were likewise lost." The profuse hemorrhage is the most frequent cause of the patient's death, though the latter may also be occasioned by the gangrene and suppuration which often follow the primary symptoms.

[The gravity of the prognosis, as asserted by Deneux, is confirmed by M. Blot in his thesis for the *Concours* (Paris, 1853). In making out a statement of 19 cases published since 1830, the latter author finds that five of them were fatal. All the children of the mothers who died were still-born.]

These tumors may terminate either by resolution, suppuration, rupture, or gangrene; but as the progress of the disease exhibits nothing peculiar in any of those cases, we shall merely mention them in passing.

The *treatment* of thrombus necessarily varies according to its size, and the sufferings thereby occasioned to the female, as also to the period at which it is manifested. If the patient be in labor when the tumor is developed, and the latter be large enough to seriously impede the passage of the head, the effused liquid should evidently be evacuated by a free incision, made on the most dependent part of the swelling, the extent of which must be proportioned to its volume. If this operation is performed some time before the head engages in the excavation, it would be advisable, after having emptied the sac, to make use of the tampon in order to prevent hemorrhage; but if, on the contrary, the tumor is only opened when the head is fully engaged, the application of the tampon may be dispensed with, for the child's head will sufficiently compress the divided vessels to prevent a further discharge of blood. In the latter case, it would be requisite to attend to the precautions described below, after the delivery.

The question is not, however, so easily decided when the thrombus appears during pregnancy or after delivery, and authors are far from being unanimous as respects the course to be pursued. To give greater precision to our therapeutic recommendation, we shall distinguish the cases in which it is necessary, 1, to incise immediately; 2, to incise at a later period; and, 3, to omit incision altogether.

1. *When it is necessary to Incise immediately.*—The tumor is sometimes so large as to fill a great part of the excavation, and seems capable of obstructing the discharge of the lochia. Careful examination then shows the skin or the mucous membrane covering its internal surface, to be so greatly thinned by distention and to present so deep a violet hue that gangrene or spontaneous rupture seems likely to occur at any moment. On the other hand, the quantity of fluid effused, and the disorder which it necessarily produces in the cellular tissue in which it has formed a large cavity, renders its absorption very improbable; the evident fluctuation discoverable over the greater part of the tumor induces the reasonable belief that it does not contain a large clot, and that there is nothing, therefore, to prevent a continuance of the internal discharge. The patient experiences acute pain, and, lastly, her increasing weakness, the feebleness of pulse, pallor of the skin, &c., lead to the opinion that the disorder is not limited to the tumor of the excavation, but that in all probability the blood is making its way to the upper part of the abdomen. Under these circumstances, it would certainly be nothing short of folly to depend upon the efforts of nature alone, and immediate incision appears to us indispensable.

2. *Postponement of Incision.*—If, however, the tumor is small, being no larger, for example, than an egg; if the walls are of considerable thickness and of a natural color; if it is but slightly painful, and does not appear to increase in size; if, from the coagulation of the effused fluid, fluctuation becomes more and more obscure; if, in a word, there is every reason to hope that the internal hemorrhage is not only arrested, but its recurrence rendered impossible through the compression of the ruptured vessels by the coagulum, I have no hesitation in believing that everything should be done to assist resolution, and, consequently, that the instrument should not be used, unless rendered necessary by certain accidents, which may occur under the circumstances.

This method, I am aware, has both its advantages and disadvantages; still I regard the former as of greater importance than the latter. As advantages, I would mention: 1, the possibility of absorption, which we certainly have occasion frequently to observe as taking place with much larger effusion; 2, the rarity of consecutive hemorrhages. This latter point we shall discuss hereafter.

The partisans of immediate incision reproach expectation with exposing the tumor to suppuration and gangrene, besides thinking that a late incision does not always protect against hemorrhage. Let us examine the worth of these objections.

The attempt to bring about resolution does not dispense with the necessity of a careful oversight of the case: now, before becoming affected with gangrene, the walls of the tumor present to the attentive eye of the surgeon certain changes which forewarn him of the danger. On the other hand, when the blood, which, extravasated in the tissues, acts as a foreign body, and excites around it first an irritation and then an intense inflammation, suppuration does not take place without having been preceded by heat, redness, greater or less tension of the tumor, and more or less pain to the patient: now we can hardly expect the physician to be so negligent as to allow all the phenomena of a suppurative inflammation to pass undiscovered. Therefore, as soon as the tumor, so far from progressing toward complete resolution, presents some of these preliminary symptoms, it will be time enough to have recourse to the operation. But would it not have been better to have practised it at once? Certainly not; for independently of the chances of obtaining resolution, you have now the advantage of performing incision under circumstances the best calculated to prevent consecutive hemorrhage.

Indeed, it seems to me undeniable, that, when the hemorrhage has ceased for several days, and the greater part of the blood is converted into a solid clot, which, either by direct compression, or by extending into the opening of the ruptured vessel, shall have obliterated the latter, the cavity may be incised without probability of hemorrhage. I am acquainted with the observations relied on by M. Deneux and others, as showing that secondary hemorrhage is not an impossible occurrence; but, in my opinion, they are far from being conclusive against the opinion which I hold.

If hemorrhage is ever to be feared as a consequence of opening sanguineous tumors of the vulva and vagina, I certainly maintain that it is especially so when practised immediately; for, as the rupture of the varicose veins is then recent, there is nothing to prevent the blood from flowing externally: the determination of blood to the parts, which may have contributed to the production of the rupture, still exists, and during pregnancy, the obstruction to the return of the circulating fluid by the large venous trunks, in consequence of the pressure of the uterus, highly developed as it is, and situated above the superior strait, is remarkably well calculated to produce venous hemorrhage. I am well aware that the tampon may be applied, as also that the partisans of immediate incision rely chiefly upon it; but whoever has used the tampon, knows what suffering it occasions when it has to be left in its place for several days, and how difficult it is, notwithstanding all the means proposed for the purpose, to maintain a free discharge of the lochia.

It appears to me that M. Velpeau, who treats the fears of some authors on the subject of hemorrhage as chimerical, has had reference rather to cases of thrombus frequently witnessed by him in non-pregnant women, than to those which appear in the puerperal state; *for, according to him, there is no vessel in this region large enough to become a source of anxiety.* This last proposition I esteem erroneous, if it be intended to apply to pregnant females; it is well known that the arteries and veins of the vagina share in the development of the entire generative apparatus, and all practitioners have felt the varicose veins projecting beneath the vaginal mucous membrane during pregnancy, and also the pulsations of large arteries. The latter sensation is so evident as to have been styled, by Osiander, the *vaginal pulse.*

Finally, it may be said that, by deferring the incision of t [illegible] r, we incur the risk of an extension of the effusion, and a se [illegible] toneum over a large surface, all of which would [illegible] viding a free exit externally. This, doubtless, is possible; but when we come to reflect upon the conditions by which we would limit the expectant method, and the attempts to obtain resolution, it will be seen that we are protected from any such danger. Besides, if it is necessary to apply the tampon after immediate incision, may not this have the same effect by obstructing the discharge of blood outwardly? Unfortunately, this is no hypothesis, for it is supported by one of M. Deneux's own observations.

At whatever period the incision is practised, it is best not to insist upon the removal of all the clots; but, at the first dressing, to respect all that seem to adhere to the surrounding parts; for while their immediate detachment would risk a return of the hemorrhage, they would come away gradually at the subsequent dressings. If necessary, their separation might be assisted by daily injections.

Another question has reference to the part of the tumor to be operated upon. Most authors agree to make the incision external, that is, through the integuments; for they find that the dressing is thereby rendered easier, that it does not require the introduction into the vagina of foreign bodies, which might obstruct the discharge of the lochia, and that the wound is not subject to irritation from the uterine fluids. I would add that the cicatrix would be less dragged upon in future labors, and, therefore, less exposed to rupture when the external parts are greatly distended by the fœtal head. I therefore adopt the external incision but upon one condition, namely, that it shall be possible, which is not always the case; for when the tumor is situated in the greater or lesser labia, it presents two surfaces, one mucous and the other cutaneous, and unless there exists a very thin and altered point,[1] which of itself deprives the surgeon of the power of choosing, it may be incised either outwards or inwards. But the thrombus is not always situated so low down; in such cases, and I would recall the one the details of which I have already related, the tumor being altogether within the excavation, and limited outwardly by the bony walls of the pelvis, presents none other than a mucous surface to the instrument. Therefore, should incision be deemed necessary, it can then only be practised upon the wall of the vagina.

I make this remark, because it forms, in my opinion, an additional reason for recommending late incisions. A large wound in the walls of the vagina is not, under ordinary circumstances, a serious affair; but in the case of a newly delivered female it would be attended with great inconvenience; for, not to speak of the serious consequences which might result from the introduction of the uterine fluids into the cavity, it is evident that a dressing which should be at once sufficiently protective and suitable, and at the same time permit the free discharge of the lochia, would be of very difficult performance.

When incision is decided upon, it should be practised freely; for a simple puncture would allow only the fluid blood to discharge, whilst clots of considerable size would certainly be left in the cavity. A too small incision would have the same inconvenience, in part; therefore, the opening should be large, and made upon the part most favorable to the discharge of the fluids. Though the incision be very extensive at the moment it is practised, on account of the great distention of the integuments, it diminishes much by the retraction of the walls of the tumor after its contents are discharged. It will, besides, have the very great advantage of facilitating the extraction of the clots.

---

[1] It were useless to state that if the integuments upon any point of the tumor are exceedingly thin, or affected with gangrene, the incision should be through the affected parts.

After the incision and the partial evacuation of the clots, it is very common for inflammation to be set up in the cellular tissue in which the effusion had taken place. This inflammation is to be opposed by the appropriate means; but, like M. Deneux, we should place in the first rank attentions to cleanliness, frequent washings, and injections, at first emollient, and afterwards containing a small amount of chlorine, to be thrown gently within the cavity.

3. *The Omission of Incision altogether.*—It is evident that whenever the means employed to assist nature in effecting resolution seem to affect favorably the size of the tumor, and its consistency, by which we mean its becoming more compact and solid, their employment should be continued, and cutting instruments abstained from.

§ 3. Various other Tumors.

The other tumors met with on the external parts of generation, are cancers, phlegmons, cysts in the thickness of the labia externa, together with various excrescences and syphilitic vegetations. But whatever may be the nature of these tumors, the course of the practitioner is always the same; that is, to do nothing, so long as, by their size and character, they do not oppose the dilatation of the vulva; but, in the contrary case, to puncture the cysts, to open the abscesses, and to extirpate the vegetations of degenerated parts. As to the *modus operandi* in these cases, it is too simple to require a particular description. The possible occurrence of serious hemorrhage ought not however, to be lost sight of. (See what is said on the subject, p. 519.)

Prompt action is not requisite in cases of polypus, for, unless it be very large, it will seldom offer an insurmountable obstacle to the expulsory efforts of the womb; because, when adherent to the vagina, these abnormal growths are often pressed beyond the vulva. But if their size should be deemed too great to permit delivery, the tumor might be removed.

In a case where M. Gensoul was obliged to apply the forceps, he seized the head and the fibrous body, whose pedicle adhered to the upper part of the vagina, at the same time, and brought them away together. The polypus weighed twenty-two ounces after it was extracted.

CHAPTER VII.

OBSTACLES AT THE NECK OF THE UTERUS.

THE difficulties which may be encountered at the neck of the uterus are due to the following causes, viz.: adhesion of the lips, complete obliteration of the cervix, rigidity of the orifice, spasmodic contraction of the orifice, various tumors, and scirrhous or other degeneration of tissue.

§ 1. AGGLUTINATION OF THE EXTERNAL UTERINE ORIFICE.

This is a very rare complication, and but few examples of it are reported in the books; though perhaps, as M. Nægèle remarks, from whom I extract the following details, this rarity is owing to the fact, that the various degrees of agglutination have escaped the notice of the physician; the powers of nature alone triumphing over the accident in most cases.

Its existence may be suspected when the inferior uterine segment descends low down in the excavation at the commencement of the labor, and presents no trace of an orifice; or when the latter presents as a fold or a hollow, which is slightly depressed at its centre, and very often not corresponding to the pelvic axis. The middle of this little depression is usually occupied by a filamentous web, some fleshy tissue, and a cellular network, in the centre of which a small narrow opening is found; sometimes the lips are held together by a consistent mucus. As the contractions become more energetic, the lower segment of the womb is forced into the excavation, and becomes so thin that, at the first exploration, the finger appears to be separated from the head by the membranes alone; but, notwithstanding the strength of the pains, the uterine orifice is not only tightly closed, but even seems to ascend somewhat, and to be carried towards one side. The orifice may open spontaneously under the pressure of the energetic contractions; but if it resists, and the accoucheur does not early recognize the source of the difficulty, a rupture of the womb, or a paralysis of it, which is not less dangerous, might result in consequence.

The question arises, what is the nature of this agglutination? It has probably followed an inflammation of the cervix uteri, and the upper part of the vagina; since the pseudo-membranous or fibrous tissue that composes it, is similar, says Nægèle, to that substance which serves as the bond of union between the placenta and womb, or that uniting the pleura pulmonalis to the pleura costalis, or the intestines with each other and with the abdominal wall, when an inflammation of these parts terminates by adhesion. In a case where a woman died during labor, the adhesion of the neck was found, at the *post-mortem* examination, to be so resistant that it could neither be lacerated nor broken by any moderate force, and the membrane that blocked it up was of an aponeurotic character.

The precise period at which its formation commences cannot be determined. In a woman who presented this peculiarity during labor, the orifice was patulous six weeks before her delivery.

The agglutination of the orifice has been remedied in most cases without much difficulty, the membrane having been easily ruptured either by the finger or some blunt instrument, and the operation has generally been followed by the loss of only a few drops of blood. The index-finger should be preferred to everything else, for if this is not sufficient to break down the obstacle, we can expect but little aid from an instrument. It is really difficult to understand how this agglutination, which almost always yields to the pressure of the finger, can resist the impetus of the strong contractions of the womb.

[I have met with two cases of adhesion of the external orifice. In the first one, which occurred at the Hospital of the Clinic, I detected the condition of things whilst practising the touch during pregnancy. I was, therefore, prepared when labor came on. At first, there was considerable resistance, but when the pains became very powerful, the adhesions yielded spontaneously, and delivery was accomplished naturally. The second case was one of a first labor, to which I was called in consultation by a physician in the city. The patient had been in pain for three days without any progress being made. I became satisfied, after several very careful examinations, that there was no opening upon the lower segment of the womb, though I thought I could detect the place of the external orifice by the existence of a very slight depression there. When a pain came on, I endeavored to destroy the adhesions by strong pressure with rapid rotation of my finger. After a few fruitless attempts, I succeeded; the opening dilated rapidly, and delivery took place in a regular manner.]

§ 2. Complete Obliteration of the Cervix Uteri.

At the present day it is an ascertained fact that the neck of the womb may be entirely obliterated at the time of labor, and by adhesions too strong to be broken down by the finger. But it is an exceedingly rare occurrence, and the accoucheur must not permit himself to be deceived by a great obliquity of the cervix, rendering the orifice of difficult access, nor by an agglutination of the lips of the os tincæ, since it is possible for an overlapping of the two latter to be mistaken for an absolute obliteration of the orifice. "Several times," says Dugès, "we have found the anterior lip covered and embraced by the posterior one, which thus masked the opening, so that the finger could only penetrate it in a very oblique direction; though, when effected, this introduction afforded a means of rectifying the error promptly, and of reducing the parts to a more favorable state."

[There can be no doubt that real obliteration of the cervix does sometimes occur. It differs from simple agglutination of the external orifice only in the greater strength of the adhesion, which requires an operation to overcome it. As regards the nature of the affection, therefore, the distinction is of slight importance.

The best work we have on obliteration of the neck of the uterus was published by M. Depaul in 1860. In it are reported three cases of his own, in addition to those which had already been made public.

The external orifice is the one usually obliterated, though the internal one is sometimes affected in the same way. The diseased action producing it sometimes begins after fecundation, though it seems probable that it oftener existed before it, having already considerably contracted the opening: under these circumstances, the intervention of pregnancy gave rise to conditions favorable to the completion of the closure. An attentive study of cases leads M. Depaul to the conclusion that these complete obliterations may have their origin in violence done to the neck of the uterus in the first labor, es[illegible] it was long, painful, and required the use of instruments. All inflammations and other alterations of the cervix may be followed by obliteration; therefore it is that primiparæ are not exempted, though less exposed to it than those who have borne children.

When the neck is obliterated, labor begins regularly, and the pains continue for several hours or days, becoming at last less frequent or ceasing entirely. The vagina is often hot and dry, and the lower segment of the uterus, rendered thin by pressure, descends very low into the pelvis, but it is impossible to discover an opening upon it. To be sure of this, however, requires great skill in touching; the vagina should be explored throughout its whole extent, even to its insertion upon the uterus, for without this, a mere obliquity of the orifice might be mistaken for an obliteration. This error has often been committed, and cannot be too carefully guarded against.

Vaginal hysterotomy is the only available treatment. Whenever it is possible to do so, the incision should be made upon the point of obliteration, which may often be recognized by a small depression corresponding to the thinned cicatricial tissue.

The mode of operating is very simple. "In one case," says M. Depaul, "I used successfully a pair of long scissors. I prefer, however, a common bistoury, long enough for the purpose, and either rounded or pointed, and protected by wrapping in linen to within half an inch of its extremity. The blade should be conducted along the fingers of the left hand, previously introduced and applied to the part upon which the opening is to be effected. The cut should be made transversely, and about half an inch only in length, the tissues being divided layer by layer." (Depaul.)

Another method is to seize the parts to be divided with a pair of toothed forceps. Then the fold which is caused to project by drawing upon the forceps may be readily cut with straight scissors, without the least fear of wounding the child. The first stage of the operation is ended when the ovum is reached. The second stage consists in making several other incisions with a blunt-pointed bistoury and curved scissors; after which the labor is allowed to proceed as usual.

§ 3. Rigidity of the Cervix.

Rigidity of the cervix, also termed *anatomical* or *mechanical* rigidity, is far less common than spasm of the neck of the uterus, often described as *spasmodic rigidity*. In anatomical rigidity, which we are now discussing, the fibres of the cervix seem endowed with an extraordinary power of resistance, which cannot be explained by any alteration of tissue. It is a sort of passive resistance which the neck opposes to the process of dilatation. Its tissue seems dense and like a piece of leather soaked in grease. The labor continues without dilatation of the orifice, which retains a certain thickness, against which the contractions strive in vain until the woman is exhausted with her fruitless efforts. This anatomical condition of the orifice must not be confounded with a neck which continues thick, simply because the contractions are insufficient, badly directed, or lost against a mechanical obstacle which prevents the engagement of the fœtus.]

Under certain circumstances, the fibres of the uterine neck seem to possess an extraordinary degree of resistance; and although they have none of the characters we are about to indicate as appertaining to an inflammatory or spasmodic contraction, yet their dilatation is not effected. According to Dewees, this resistance of the cervix uteri is particularly apt to be met with in very young girls, or in middle-aged women in their first labors, and also in those cases in which parturition takes place prematurely.

There is one symptom that would lead us to suspect rigidity of the os uteri, even before an examination; we allude to what is ordinarily termed the pains in the loins. These have always appeared to Madame Lachapelle to be a consequence of the rigidity of the external orifice, either from its experiencing a kind of cramp, or that, because of its having to sustain the whole force of the uterine contraction in consequence of its firmness, it suffers more than when soft and yielding.

Prolonged baths, employed from the beginning of the labor, and bleeding from the arm, if not contraindicated by the general condition of the patient, are the only measures which need be used under the circumstances.

However, as this extreme slowness appears from the beginning of the labor, that is to say, at a period in which the membranes are still intact, the life of the fœtus is by no means endangered thereby, and its only effect is to fatigue the mother greatly. Therefore, unless some dangerous complication should supervene, there is nothing to do but recommend patience. Still, if the labor should be extremely prolonged, and by its duration seem likely to endanger the life of the mother, it would be right to make a few incisions upon the lateral parts of the cervix.

§ 4. SPASMODIC CONTRACTIONS OF THE NECK.

Again, it may happen, that after having attained a considerable degree of dilatation, the cervix becomes affected with spasmodic contraction, whereby its subsequent expansion is retarded, or suspended altogether for several hours. The orifice then presents a thin, cutting edge, and is warmer, drier, and more sensitive to pressure of the finger; in short, is much more irritable than usual.

This condition, which has been designated as spasmodic contraction of the external orifice, may be confounded with the simple rigidity just spoken of, and with the natural retraction of the neck, when the presenting part of the child does not engage in its opening immediately after the rupture of the membranes. In the latter case, however, the thick, soft, and easily dilatable edges of the orifice will always enable us to avoid error. In the former case, the diagnosis is often more difficult if all the phenomena of the labor have not been watched, and the extreme sensibility of the neck, which is not generally met with in rigidity, will be the only evidence that we have a case of spasmodic contraction to deal with.[1]

This state of spasm does not generally last for a great while; but so long as it exists, the dilatation is extremely slow, and sometimes hardly takes place at all. Usually, however, the efforts of the body of the womb overcome the resistance at last, and the head of the fœtus clears the orifice; but in some cases it happens that, being no longer supported, the neck retracts immediately, and grasps the neck of the fœtus more or less forcibly, so that a new dilatation is required to allow the shoulders to pass; nor is this second dilatation as easy as might be expected.

This spasm of the external orifice may be met with in strong and plethoric women, but also in lymphatic, nervous, and very irritable individuals, of a pale and relaxed fibre. In the former case, general bleeding is one of the first measures to be had recourse to, but in the latter it might prove hurtful. Under both circumstances, however, recourse may be had with advantage to emollient injections, fumigations, baths, and the administration of laudanum by clysters, or, preferably, the application of belladonna to the uterine neck itself. Chaussier, who has particularly recommended the use of this latter remedy, was in the habit of using an ointment prepared by mixing and triturating one drachm of the extract or juice of belladonna with an ounce of lard. But as the application of this ointment is quite difficult, Professor P. Dubois prefers the ordinary dry extract. He places a little pellet of it, about the size of a pea, on the nail of the index-finger, which latter is then carried up to the cervix, where, in the course of a few minutes, the heat and moisture of the parts soften the extract, which is then readily smeared over the external and internal surfaces of the neck.

---

[1] Rigidity is a passive force, by which the fibres of the orifice resist the dilatation they have to undergo. Spasmodic contraction is an active force, by which the fibres contract and diminish the size of the opening previously exhibited by the mouth of the womb.

The belladonna, so highly lauded by some accoucheurs, is by others thought to be useless. It seems to me that this difference of opinion has arisen from confounding simple rigidity with spasmodic contraction. Though without action in the former case, I think it very useful in the latter.

If all these measures prove unsuccessful, or if an accident, which endangers the life of the mother or child, should demand a prompt termination of the labor, the accoucheur will have to choose between a forcible introduction of the hand and multiple incisions upon the neck. (See *Difficulties of Pelvic Version.*)

[Incision of the neck, or vaginal hysterotomy, is certainly the preferable operation. To perform it, a blunt-pointed bistoury is laid upon the forefinger and conducted to the orifice, which it cuts by a conjoined sawing motion and pressure. The larger part of the blade is previously wound with a piece of linen bandage in order to protect the vagina. The multiple incisions in this case yield all their advantages, and render consecutive laceration far less probable than would a single incision. Very rarely will it be necessary to make them more than half an inch long, whilst they may be often less than this; for it is the almost universal practice to be content with cuts of from three to four-sixteenths of an inch in depth only, around the circumference of the orifice. The lateral parts of the neck should be chosen for the incisions; though, if necessary, they may be made upon the anterior lip, and lastly, upon the posterior one.

In the vast majority of cases the operation is a very simple one, though some difficulty may be encountered in the use of an ordinary blunt-pointed bistoury. In this case, a curved blunt-pointed bistoury, with a concave edge, is preferably employed.

For my own part, I choose almost always a pair of angular scissors, with blades shaped like a raven's bill. It is directed upon the finger, opened when the orifice is reached, and after one blade is inserted between the ovum and the orifice the incision is made.]

But it is not the external orifice alone which may retard the delivery of the fœtus by retracting on its neck, for very often the internal one, or rather that portion of the uterine walls which corresponded to it in the non-gravid state, retracts forcibly on the neck of the child, even before the head has cleared the external orifice; so that the latter, being retained in the portion of the organ that appertains to the neck after delivery, can advance no further. This internal contraction only takes place where the waters have escaped for some time, and it evidently results, as Dewees has remarked, from the double tendency of the womb to regain its primitive form, and to accommodate itself to the shape of the parts contained within its cavity.

There is every reason to suspect that the delay in the progress of the head is dependent on this cause, when, notwithstanding the energy of the pains and the absence of all other sources of dystocia, it is found to make no advance at all, or, even if it approaches the vulvar orifice during the contraction, it returns to its primitive position immediately afterwards. Besides which, if the finger is slipped above the head, the latter will be found free in the excavation; but one of the orifices (the internal one, most usually,) will be strongly retracted around the neck.

Bleeding, general bathing, and laudanum injections may be employed usefully under these circumstances also, though it sometimes happens that the contraction of the internal orifice persists notwithstanding. Under these circumstances, should version be judged necessary, the most serious difficulty may be anticipated in passing the hand through the retracted part; and if the application of the forceps be deemed requisite, as it would be if the head were already engaged, but delayed by the retraction of the internal orifice, this latter circumstance, by arresting the shoulders, would render the delivery impossible. It is then we must have recourse to the measures so much vaunted, and so often employed by Dewees with success, namely: to bleeding in the arm, pushed *ad deliquium animi*. But, in order to avoid drawing too great a quantity of blood, the patient should be directed to stand up, if possible, and, as soon as fainting occurs, she is to be replaced on the bed; when, according to the American accoucheur, the relaxation in the retracted orifice, produced by the syncope, will be such that the pelvic version, or the extraction of the head by the forceps, can always be performed. Finally, in those cases where the woman's general condition does not permit a resort to blood-letting, we may employ the opiates in a full dose, either by the mouth or by injection, with great advantage. The inhalation of chloroform may also prove very useful.

The reader will also understand that, in a natural labor by the pelvis, the retraction of one of these orifices may likewise arrest the head. Under such circumstances, if the source of difficulty is confined to the external one, numerous incisions might be made in the ring of the os uteri; but if it is at the internal orifice, Dewees' plan should certainly be followed. It is likewise important to ascertain at once whether the child is still living; for though it be difficult to admit that a strangulation of the fœtus can occur from direct pressure, yet it is not the less true that the umbilical cord, from being nearly always compressed in these unfortunate cases, exposes the child to a speedy death; and if the infant is already lost, we may employ, beneficially, either belladonna, or the opiates internally, according to the orifice retracted.

In cases of this kind, the use of anæsthetics might prove serviceable, by producing relaxation of the partial sp [illegible] the uterine fibres. M. Dubois has administered them with [illegible] an example given in the excellent thesis published by Dr. Tissier on the subject. (*Paris Theses*, 1860.) In all cases, chloroform should be tried before having recourse to bleeding to syncope.

§ 5. Obliquity of the Orifice.

In consequence of the usual direction of the uterus, the neck is slightly turned downward and backward. The posterior obliquity may, in some cases, be much greater, whilst in others the orifice may be directed strongly forward, or toward one of the sides of the pelvis. When treating hereafter of malpositions of the body of the womb, we shall have occasion to speak of the effect of retroversions and lateral obliquities upon the direction of the neck. We would treat at present of the posterior obliquity of the orifice, which is by far the most frequent.

The posterior obliquity of the neck may be due to an extreme anteversion of the body of the organ, though it may also be very well marked, even when the fundus of the womb projects no farther forward than usual. This deviation of the orifice may also take place during labor; but it may also exist in the latter stages of pregnancy.

In the former case, the obliquity is due to the fact that the dilatation of the orifice is effected more at the expense of the posterior than of the anterior lip, and, consequently, the plane of this opening would naturally be found, in most cases, behind the long axis of the organ. Wherefore, this irregular dilatation may, independently of any deviation in the fundus, produce such an obliquity of the neck, that the plane of its orifice, instead of being horizontal, has very nearly a vertical direction; that is, the opening looks directly towards the anterior face of the sacrum, its anterior margin has become inferior, and its posterior one is now the superior. When existing before the commencement of labor, its mode of production is altogether different. We know that in vertex presentations the head of the fœtus engages in the excavation in the latter months, pressing the lower part of the uterus before it. Now, in the normal direction of this organ, it is evident that the head must press more especially upon the portion anterior to the orifice, which anterior portion it must carry before it. Hence, it is plain the external orifice of the neck must necessarily be situated altogether posterior to the projection formed by the head in the lesser pelvis.

But whatever may be the manner and time of its production, its effect upon the progress of the labor is always the same. Consequently, when the child's head is urged on by the uterine contractions, it presses the anterior inferior wall of the uterus before it, and thereby evidently retards the delivery. In fact, the dilatation of the neck must necessarily be very slow and imperfect; besides, the expulsive efforts are spent against the anterior part of the cervix, which part, corresponding to the void in the pelvis, and being distended by the head, is sometimes forced down nearly to the vulva, and threatened with a rupture. Most generally, there is time for rectifying this unfavorable situation of the cervix; nevertheless, the patient must remain in bed as much as possible; for it is very apparent that, in the erect position, the body of the womb constantly augments this posterior obliquity in the neck by being carried forwards. The termination of the labor may also be facilitated by placing the orifice in its natural position with the finger; this is done, during the interval, by hooking the anterior lip, and carefully bringing it to the centre of the vagina, and then sustaining it in this position until a new contraction comes on; when the head is forcibly pressed down and engages in the opening, and no longer permits the lip to regain its abnormal position. The labor is sometimes speedily terminated after this little manœuvre.

It occasionally happens that the cervix uteri is well dilated, though not as yet sufficiently so to permit the parietal protuberances to traverse it; and this condition of things lasts for a considerable period, notwithstanding the long and acute sufferings of the patient. In such cases, the engagement of the head may be singularly facilitated by making a slight pressure on all the periphery of the orifice with the extremity of the index-finger, carried rapidly around it.

Again, the dilatation may often be completed and the head be down in the excavation, but notwithstanding the expulsory efforts of the womb, it is retained there by the anterior lip of the neck, which is pressed before it; the head cannot overcome the resistance thus made by the band formed by the anterior lip, and several hours may elapse without any advance in the progress of the labor. When this happens, the following course should be adopted in order to promote a prompt engagement at the inferior strait: taking advantage of an interval, the accoucheur hooks the anterior lip with his finger, and draws it towards the symphysis pubis, where it is retained until the pain comes on; then the extremity of the finger, placed under this portion of the neck, pushes it above the descending part of the head, until it gets beyond the occipital boss; when the occiput is found to engage almost immediately in the pubic arch, and the labor terminates two or three hours sooner than it would have done without this little manipulation. It is occasionally necessary to repeat these attempts several times; but as they are attended with no inconvenience when properly performed, they may be renewed without fear. We will add, that the most favorable period for this purpose is that when the head, after having reached the pelvic floor, is on the point of clearing the inferior strait, provided the pains are energetic, and the cervix sufficiently dilated to permit the passage, if the axis of its orifice were parallel to the axis of the head.

§ 6. SWELLING AND ELONGATION OF THE ANTERIOR LIP.

It is not at all unusual to find the head descending in the excavation long before the complete dilatation of the os uteri, whereby the anterior lip is necessarily compressed between the former and the symphysis pubis. As a general rule, this compression, and the consequent pain, disappear on the prompt termination of the labor; but if the latter be prolonged, and especially if the pelvis scarcely reaches its normal dimensions, the compression is very severe, a considerable tumefaction will result in that part of the anterior lip found below the constricted point. Duclos, of Toulouse, has met with three instances of this kind, two of which were in the same [illegible]; M. Nægèle has published another, Dr. Lever two more, and M. J [illegible] making seven in all. M. Blot mentions a case in which the tumor formed by the anterior lip was an inch and a quarter thick, and forced down to the vulva. The labor had to be terminated by the forceps.

The following case is one of those reported by Duclos: A woman, thirty-four years of age, who was in labor with her fifth child, was suddenly attacked, after twenty-four hours of moderate pains, by acute sufferings, which called forth loud cries; an elongated body appeared between the lips of the vulva, and its apparition was accompanied by a slight hemorrhage, pallor, and feebleness. On his arrival, he found a cylindrical tumor projecting four fingers' breadth beyond the parts; it was two inches broad near the vulva, and was irregular, resistant, and of a wine-like color. After a careful examination, he ascertained that it was formed by the elongated and tumefied anterior lip of the cervix. He first thought of applying the forceps on the child's head, but afterwards concluded to aid its delivery by drawing on the occiput, and operating on the forehead by means of the index-finger previously introduced into the rectum. In the cases observed by Nægèle and Danyau, as also in one of the women reported by Lever, the labor terminated spontaneously. There is, therefore, nothing to be done in most instances; though if the tumor be of large size, very tense and black, and apparently threatened with gangrene, the example of the English surgeon just named might be followed; that is, to make a number of punctures, for the purpose of evacuating the infiltrated liquids and diminishing its volume.

On the whole, then, I may remark, with M. Danyau, that this species of tumefaction can scarcely be considered as a mechanical obstacle to the delivery; and that the unusual length of the labor must rather be attributed to the extreme pain it occasions, and to the disorder and irregularity of the uterine contraction caused thereby.

The cases recently mentioned by M. Montgomery under the name of *thrombus of the lips of the cervix*, and which will soon be described (see page 705), are evidently instances of this affection. The observations of the Irish accoucheur appear to us similar to those just mentioned. As regards the prognosis, however, it is important to distinguish simple infiltration from a true effusion.

M. Montgomery thinks that this condition of things might be mistaken for a case of insertion of the placenta upon the neck, the tissue of the infiltrated lip bearing considerable resemblance to the placental tissue. Still, as he observes, it may always be readily ascertained that the tumor is not only applied to the internal surface of the womb, but that it is also situated in the substance of the latter. The finger can never be made to penetrate between the tumor and the internal surface of the uterus.

§ 7. ABSCESSES IN THE LIPS OF THE CERVIX UTERI.

Genuine abscesses are occasionally developed in the substance of the lips of the os tincæ, which, independently of the unfavorable influence they may have over the gestation, must necessarily disturb the regular progress of the labor; because, where they invade a considerable portion of the neck, its dilatation is thereby rendered very slow and very painful; besides which, their size may be so great as to retard the passage of the head. The reader will find in Bonet (*Sepulchretum*, vol. ii., lib. iii., sec. 38, Obs. 2) the history of a woman who died without having been delivered, after five or six days of suffering, in whom a large abscess, filled with putrid pus, and occupying the neck of the womb, was found at the *post-mortem* examination.

If the presence of fluctuation should establish the diagnosis, the proper course would evidently be to incise the tumor.

§ 8. SANGUINEOUS TUMORS OR THROMBUS OF THE LIPS OF THE NECK OF THE UTERUS.

We have already seen that the anterior lip of the cervix sometimes becomes considerably swollen during labor, and that the swelling may sometimes be occasioned by an infiltration of blood. This infiltration, which may become a mechanical obstacle to the expulsion of the head, is certainly the first degree of a much more serious accident; for the blood, which is merely infiltrated at the outset, may, by separating the meshes of the tissues of the neck, collect in a cavity, which, by opening afterward in the same way as the thrombus of the vulva, may give rise to mortal hemorrhage. A case of this kind was communicated to the Obstetrical Society of Dublin by Dr. Johnson, and its character was so remarkable as to justify our giving a short analysis of it.

A woman, who had already given birth to six children, was delivered for the seventh time, after four hours of easy labor. The child presented by the breech. The after-birth came away without difficulty, and the patient was perfectly well for the first three days; about the fifth day, however, she was seized suddenly, and without any apparent cause, with profuse flooding.

The uterus was thoroughly contracted, and yet, notwithstanding the employment of the most appropriate means, she died in about an hour and a half. All the abdominal and thoracic organs were found, at the autopsy, to be perfectly healthy. The uterus was well contracted, but upon the left side of its neck, at about an inch from its orifice, there was discovered a rupture, with irregular and blackened edges. This opening, which was large enough to permit the easy introduction of two fingers, conducted into a cavity formed in the substance of the neck, large enough to contain a small orange. Five or six open vessels, of a size sufficient to admit the introduction of a small bougie, were observed upon the internal surface of the cavity, and were proved by insufflation to communicate with the uterine sinuses. "A careful examination of the specimen," says Mr. Montgomery, "convinced me that it was a case of thrombus, whose external envelope formed a thin layer of the uterine tissue, became gradually thinner, and finally ruptured. The fluid and coagulated blood escaped through the rupture, and the hemorrhage continued." (*Dublin Quarterly Journal*, 1851).

The thrombus is, in all probability, developed during labor, under the following circumstances. When the neck is half dilated and the waters discharged, the anterior lip is found to swell, thicken, project, and descend beneath the presenting part, usually the head, to the disengagement of which it sometimes presents an insurmountable obstacle. An infiltration of blood, which may become converted into a sanguineous collection, is soon formed in the substance of the lip. The cavity increases in size, [illegible]s walls rupture and give rise to hemorrhage. The discharge may then take place during the labor itself, though far more frequently it does not appear until some time after delivery. In the latter case, it is more likely to prove dangerous, as the complete retraction of the uterus makes it difficult for the accoucheur to divine the true cause.

The introduction of a tampon into the vagina is certainly the most useful measure that can be employed.

§ 9. Fibrous Tumors and Polypi of the Cervix.

Besides the indurations, the œdematous swellings, and the cancerous degenerations affecting the cervix uteri, which will be described in the following paragraphs, there are certain tumors, which, though filling up the excavation, really have their origin or seat in the proper tissue of the neck; others, that arise from the body of the womb, to which they still adhere by a long pedicle, are found hanging down into and obstructing the cervix.

A. *Fibrous Tumors of the Cervix Uteri.*—These tumors may be developed in the neck as well as in the tissue of the uterine walls. In a case described by Madame Lachapelle, the pelvic excavation was almost entirely occupied by a tumor that seemed inclosed in the lateral and posterior portions of the neck; it was as large, she states, as the head of a fœtus at term, and would have been the more likely to deceive an inattentive person, from the fact of its presenting a depression similar to a fontanelle. The child was very small, and had been dead for a long time; so that, notwithstanding the size of the swelling, it was enabled to flatten it down and pass through the narrow passage that still remained free. Madame Boivin and M. Dugès found, when making a *post-mortem* examination of a woman who died of peritonitis, after a very painful though natural labor, a fibrous body about the size of the fist in the substance of the neck; the child had a fractured cranium, and was still-born. In another case of the kind, Ramsbotham was obliged to resort to embryotomy; but the woman recovered.

M. Danyau reported to the Academy (1851) a case in which he was much more fortunate, for he succeeded in enucleating a tumor of considerable size which had been developed in the posterior lip of the cervix. Encouraged by the idea that, although he might not be able to remove it altogether, he might, at least, extirpate a portion large enough to give passage to the fœtus, he determined to operate, and was successful in bringing it away completely. The appearance of the tumor was precisely that of a fibrous tumor of the uterus; it weighed about twenty ounces, and its greatest diameter was six inches. When enucleated completely, the tumor was drawn down, but could not be extracted until after it was divided into two parts.

I was called, in February, 1853, to take charge of a young woman at term in her third pregnancy, and whose waters had been discharged four days previously.

Upon practising the touch, I was astonished to find the excavation filled by a tumor apparently of the size of a full-grown fœtal head. At first I was unable to discover the orifice of the womb, and it was only by carrying the finger very high up in front and to the left, that I succeeded in introducing the index into something like the finger of a glove, which appeared to me to be the cervix retaining its full length. Penetrating still deeper, I at last reached the internal orifice, above which I distinguished the fœtal head.

What, now, was the nature of the great tumor which had thus turned the neck aside, and prevented the effacement that it should have undergone during the last few weeks of gestation? Where, also, was it situated?

My first hope was, that it would prove to be merely an exaggerated anterior obliquity of the neck, and I asked myself, whether what sometimes happens to the anterior lip, had not occurred in the present instance to the posterior one, and whether the latter, forcibly depressed by the fœtal head, did not alone form the tumor which filled the excavation. But the tumor had a peculiar consistence and apparent fluctuation, by no means resembling the hardness of the head, besides which, the hypothesis did not explain the persistence of, and the increased length of the neck. A fresh examination induced me to conclude that a solid tumor had become developed in the substance of the neck.

The waters had continued to discharge for the past four days without any pain, and I resolved to wait. The next day, the condition of things remaining the same, I requested M. Dubois to examine the patient.

A long investigation induced M. Dubois to suppose that a cyst containing fluid had formed in one of the lips of the orifice, and therefore he recommended waiting, and finally puncture, if the tumor should appear to present an insurmountable obstacle, after labor had continued for a certain time.

At first I did not coincide with this diagnosis, but it also seemed to me wisest to wait for the pains. The latter appeared decidedly on the evening of the next day, five days after the membranes were ruptured; they continued all night without effecting any change either in the tumor, or in the situation or length of the neck. To clear up the diagnosis, I introduced the entire hand into the excavation, and grasping the whole tumor, I declared joyfully to my friend, M. Parchappe, that I had been deceived, that M. Dubois was right, and that, most happily, we had to deal with a cyst.

With a long trocar, of at least an eighth of an inch in diameter, I made a puncture, but to my great surprise nothing escaped. I endeavored to remove obstructions from the tube, if there were any, but in vain; nothing appeared.

My sensations were so decided, and so convinced was I that I had to deal with a cyst, that I had no hesitation in puncturing anew; but the same result followed, and I was obliged to relinquish the idea.

M. Dubois being absent, I requested my professional brother and friend, M. Danyau, to assist me with his advice. I related to him all that had passed, and insisted especially upon the result of my two punctures, but notwithstanding all this, M. Danyau, after examining the patient, was convinced of the existence of a cyst. He made two successive punctures, but not a drop of fluid escaped. There was no avoiding the conclusion; it was not a cyst.

What, then, was to be done? We could no longer hear the pulsations of the fœtal heart. After proving our incapacity of making an exact diagnosis of the nature of the tumor, we thought that its soft and apparently fungous

ture and give rise to hemorrhage. The discharge
ing the labor itself, though far more frequently it
time after delivery. In the latter case, it is mo
as the complete retraction of the uterus make
to divine the true cause.

The introduction of a tampon into the v
measure that can be employed.

§ 9. FIBROUS TUMORS AND POLYPI

Besides the indurations, the œder
generations affecting the cervix uter
paragraphs, there are certain tum
tion, really have their origin or
that arise from the body of th
pedicle, are found hanging d

A. *Fibrous Tumors of the*
in the neck as well as in t
by Madame Lachapelle,
by a tumor that seeme
neck; it was as large,
have been the more l
its presenting a dep
and had been dead
swelling, it was e
passage that sti
when making r
after a very p
the fist in th
and was stil
to resort to

M. Dan
more fort
which h
by the
might,
he de
The
uter
incl
not
t
d

extent, and thus create
The tumor was there-
ble to reach the head.
ficulty, but notwithstanding
it obstructed the entire exca-
ead impossible. Craniotomy
eps were equally unsuccessful.
umor, the patient was pale and
came weaker and weaker. But a
pelvic version. It was performed
s, bringing with it the entire tumor
the child.
hours, and the unfortunate lady was ex-
centa, ergot was administered, the uterus
expelled almost spontaneously. Notwith-
and the use of all kinds of tonics and stimu-
from the womb, which in a patient already
from the operation, was sufficient to cause a
She died about half an hour after her delivery.
the tumor, which was larger than the head of a
formed in the *anterior lip* of the cervix. By its weight,
it had during life so twisted the neck around, as to
lip in front, which explains the situation of the orifice, as
the tumor accounts for the persistence of the length of the neck,
the progress of gestation.
The tumor was constituted of a soft and spongy tissue, resembling rarefied
tissues, the meshes of which circumscribed numerous cavities, in
which no fluid was to be found. No abnormal element could be discovered
by the most careful examination, no newly-formed pathological product; it
was simply an enormous hypertrophy of the tissue of the neck. Such was
the opinion of several professors who examined the specimen at the School
of Medicine.

There is every reason to believe that this tumor was developed during the last pregnancy, for, eighteen months before this last delivery, I attended her on account of a miscarriage, and did not at that time detect any anomaly either of structure or form affecting the neck.

[The preceding example shows how difficult the diagnosis may be in such cases. To avoid error, it ought to be borne in mind that fibrous tumors of the uterus often become softened during pregnancy to such a degree as wonderfully to resemble those containing liquid. I have already met with several examples of this kind. The softening should be seriously considered as regards the prognosis, as it facilitates the flattening of the tumor. Thanks to it, the fœtus has sometimes been known to engage in the pelvis by the side of a tumor which at first seemed as though it would render delivery impossible. I witnessed one of these unlooked-for terminations in connection with Dr. Franquet, a patient of whom had a tumor of the neck and lower segment of the uterus descending into the cavity of the pelvis and occupying one half of its area. In the case of this woman, it might very well have become a question whether the Cæsarean operation should be performed. She was, nevertheless, delivered at term of a living child which presented by the breech.]

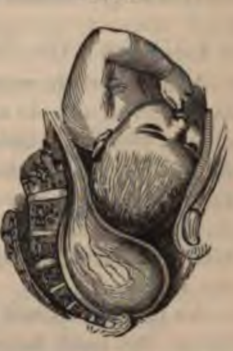
feared or hoped for in such cases. or is very small and so situated as to ameters of the pelvis, or extirpate it, if danger, which seldom happens; on the nger permits us to attempt the extraction of embryotomy; and, if the excavation is com- passage for the child by the Cæsarean operation. ediculated tumors, whether attached to the neck struct delivery only at the cervix. On this account connection. They are not so serious as the preceding as they can generally be extirpated, although their size nder them an insurmountable obstacle to delivery.

rule their diagnosis is readily made out, though several sin- on this head are recorded by authors; for example, Dr. Merri- a case in which an experienced physician mistook a polypus for of a child; and Smellie furnishes two similar instances; conse- y, we must not trust to a superficial examination.

e influence of uterine polypi over the progress of labor will be modified number of circumstances; thus, when the tumor is small, it may be ressed against one of the walls of the excavation by the child's head, he latter then passes before it; or, where the pedicle is very long, the s mass is pushed by the head entirely out of the vulva, and therefore retards the fœtal expulsion in a slight degree. This occurred in a reported by Dr. F. H. Ramsbotham; who says, "I was summoned to a n in labor, and found a tumor of the size of a goose's egg hanging in agina. (Fig. 109.)

had no difficulty in determining it to be a polypus, whose pedicle was hed to the internal wall of the organ above the neck. Dilatation took rapidly, and the membranes ruptured; then, in less than an hour, the urged on by powerful contractions, forced the body of the polypus le of the vulva and became disengaged." (*Obstetric. Med. and Surg.*, 7.)

FIG. 109.



This figure, taken from Ramsbotham's work, shows the situation of the polypus described by him.

ter having consulted with his father, whether it advisable to remove the polypus at once, the ion was determined in the negative.

many cases, therefore, we may trust to the re- es of the organism, remembering at the same that too great a delay is not without danger to the mother and child; and, where the ineffi- y of the uterine contractions has been fully tained, a division of the pedicle appears to us the only resource. If the subsequent extrac- of the tumor is rendered very difficult by its ne, it might be cut up into several pieces, as I seen done on two occasions, or be firmly grasped a small serrated forceps. Pelvic version, which ommended by some authors, could be performed ose cases only in which the length of the character would enable us to incise it throughout its extent, and thus create a passage to the fœtus, which we then might extract. The tumor was therefore divided into two lateral parts, and we were able to reach the head.

The forceps were at first applied with much difficulty, but notwithstanding the diminution that the tumor had undergone, it obstructed the entire excavation, and rendered the extraction of the head impossible. Craniotomy and the application of the cephalotribe forceps were equally unsuccessful.

Blood flowed freely from the incised tumor, the patient was pale and prostrated, and the uterine contractions became weaker and weaker. But a single feeble hope remained, namely, pelvic version. It was performed immediately, and the trunk of the fœtus, bringing with it the entire tumor externally, enabled us at last to extract the child.

The operation had lasted two hours, and the unfortunate lady was exhausted. Before extracting the placenta, ergot was administered, the uterus rubbed, and the after-birth was expelled almost spontaneously. Notwithstanding all our precautions, and the use of all kinds of tonics and stimulants, some blood still escaped from the womb, which in a patient already exhausted by the hemorrhage from the operation, was sufficient to cause a fatal termination. She died about half an hour after her delivery.

The autopsy showed that the tumor, which was larger than the head of a child at term, had formed in the *anterior lip* of the cervix. By its weight, which was considerable, it had during life so twisted the neck around, as to bring the posterior lip in front, which explains the situation of the orifice, as the seat of the tumor accounts for the persistence of the length of the neck, notwithstanding the progress of gestation.

The tumor was constituted of a soft and spongy tissue, resembling rarefied placental tissue, the meshes of which circumscribed numerous cavities, in which no fluid was to be found. No abnormal element could be discovered by the most careful examination, no newly-formed pathological product; it was simply an enormous hypertrophy of the tissue of the neck. Such was the opinion of several professors who examined the specimen at the School of Medicine.

There is every reason to believe that this tumor was developed during the last pregnancy, for, eighteen months before this last delivery, I attended her on account of a miscarriage, and did not at that time detect any anomaly either of structure or form affecting the neck.

[The preceding example shows how difficult the diagnosis may be in such cases. To avoid error, it ought to be borne in mind that fibrous tumors of the uterus often become softened during pregnancy to such a degree as wonderfully to resemble those containing liquid. I have already met with several examples of this kind. The softening should be seriously considered as regards the prognosis, as it facilitates the flattening of the tumor. Thanks to it, the fœtus has sometimes been known to engage in the pelvis by the side of a tumor which at first seemed as though it would render delivery impossible. I witnessed one of these unlooked-for terminations in connection with Dr. Franquet, a patient of whom had a tumor of the neck and lower segment of the uterus descending into the cavity of the pelvis and occupying one half of its area. In the case of this woman, it might very well have become a question whether the Cæsarean operation should be performed. She was, nevertheless, delivered at term of a living child which presented by the breech.]

These examples show what may be feared or hoped for in such cases. Thus, we should wait when the tumor is very small and so situated as to correspond with one of the large diameters of the pelvis, or extirpate it, if the bistoury can reach it without danger, which seldom happens; on the other hand, where its size no longer permits us to attempt the extraction of a living infant, to resort to embryotomy; and, if the excavation is completely obstructed, to open a passage for the child by the Cæsarean operation.

B. *Polypi*, or fibrous pediculated tumors, whether attached to the neck or body of the womb, obstruct delivery only at the cervix. On this account both are treated of in connection. They are not so serious as the preceding tumors, inasmuch as they can generally be extirpated, although their size would seem to render them an insurmountable obstacle to delivery.

As a general rule their diagnosis is readily made out, though several singular errors on this head are recorded by authors; for example, Dr. Merriman relates a case in which an experienced physician mistook a polypus for the head of a child; and Smellie furnishes two similar instances; consequently, we must not trust to a superficial examination.

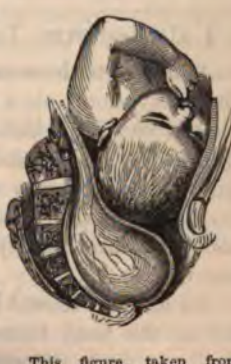
The influence of uterine polypi over the progress of labor will be modified by a number of circumstances; thus, when the tumor is small, it may be compressed against one of the walls of the excavation by the child's head, and the latter then passes before it; or, where the pedicle is very long, the fibrous mass is pushed by the head entirely out of the vulva, and therefore only retards the fœtal expulsion in a slight degree. This occurred in a case reported by Dr. F. H. Ramsbotham; who says, "I was summoned to a woman in labor, and found a tumor of the size of a goose's egg hanging in the vagina. (Fig. 109.)

"I had no difficulty in determining it to be a polypus, whose pedicle was attached to the internal wall of the organ above the neck. Dilatation took place rapidly, and the membranes ruptured; then, in less than an hour, the head, urged on by powerful contractions, forced the body of the polypus outside of the vulva and became disengaged." (*Obstetric. Med. and Surg.*, p. 237.)

After having consulted with his father, whether it was advisable to remove the polypus at once, the question was determined in the negative.

In many cases, therefore, we may trust to the resources of the organism, remembering at the same time, that too great a delay is not without danger both to the mother and child; and, where the inefficiency of the uterine contractions has been fully ascertained, a division of the pedicle appears to us to be the only resource. If the subsequent extraction of the tumor is rendered very difficult by its volume, it might be cut up into several pieces, as I have seen done on two occasions, or be firmly grasped with a small serrated forceps. Pelvic version, which is recommended by some authors, could be performed in those cases only in which the length of the

FIG. 109.



This figure, taken from Ramsbotham's work, shows the situation of the polypus described by him.

pedicle gives great mobility to the tumor, and allows it to be pushed above the superior strait. It is unnecessary to add that, if the existence of this tumor in the canal be ascertained during the latter months of gestation, it should be excised immediately, if it be of sufficient size to render the parturition difficult or tedious.

§ 10. FUNGOUS, OR CAULIFLOWER TUMORS, &c.

These tumors, which resemble a cauliflower in their appearance, may arise from either lip of the womb; and then by acquiring a considerable size, they mask the orifice and render it nearly inaccessible. As they often give rise to hemorrhage, and as the spongy tissue that constitutes them has some analogy with the placental structure, they have occasionally been mistaken for a placenta prævia. Both Madame Lachapelle and Denman relate errors of this character; and I witnessed the following still more singular case. The internes of the Lourcine Hospital sent for M. Nelaton, who was surgeon to the establishment, to turn in a supposed case of hand presentation. M. Nelaton desired me to accompany him; and, on our arrival, we ascertained that these young gentlemen had mistaken an enormous cauliflower excrescence, that sprung from the anterior lip of the cervix uteri, for the hand; its pedicle was at least an inch and a half long, and its base presented five or six little vegetations that had been mistaken for the fingers.

It frequently happens that these tumors are small enough to admit of the child's spontaneous delivery; indeed, such was the fact in the case just mentioned; but there are many others where the accoucheur is less fortunate. Take, for instance, the seven cases reported by Puchelt; in one of which it was necessary to make incisions upon another part of the hard and scirrhous neck, so as to secure the introduction of the hand, and in a second, to remove the tumor, that was attached to the anterior lip and occupied all the vagina, by the scissors; gastrotomy was resorted to in a third, on account of a rupture of the womb, and not even the child was saved; in another, the extraction of the child was impossible, notwithstanding the perforation of the cranium, and the woman died before delivery. Only a single mother survived.

§ 11. ENCYSTED TUMORS.

Adhering to the cervix uteri, or to the vaginal walls, they may also exist in the excavation. As a general rule, they are rounded, well defined, movable, elastic, yielding a little under a moderate pressure, and sometimes fluctuating; the mucous membrane covering them remains unaltered. A small puncture, in the way of exploration, will always dissipate any doubts concerning their true nature, especially if containing a liquid; and where they inclose a solid, cheesy, or fatty matter, some portions of it will adhere to the canula.

An attempt should be made to push the tumor above the superior strait, before the head becomes engaged; and the membranes must be ruptured early, so as to determine the engagement of the fœtus. In the opposite case, it will be requisite to evacuate the liquid by a simple puncture, or even to make an incision large enough to allow the contents to be pressed out.

§ 12. Induration, with Hypertrophy of the Cervix Uteri.

This affection is more frequently observed in the anterior than the posterior lip, though it may affect both; but in no case has the volume of the indurated part been great enough to impede, mechanically, the expulsion of the child; but the alteration very often retards the dilatation, and sometimes even renders it impossible. Venesection and tepid bathing may be resorted to with advantage. Certain English practitioners highly extol the use of tartar emetic, given in nauseating doses, but I have not had an opportunity of testing its efficacy. If these means prove ineffectual, or if some more grave complication requires the prompt termination of the labor, we might have recourse to repeated incisions made on the neck of the womb.

§ 13. Of the Cancerous Neck.

Like all the organs of the economy, the cervix uteri may be affected with scirrhus, or may form an encephaloïd tumor; and when this does take place the prognosis is very unfavorable, both for the mother and child. For example, of twenty-seven females reported by Puchelt, five died during the labor, nine shortly after delivery, and but ten recovered; the fate of the other three is not stated. However, if the disease is still in its first stage; if the patient's general condition is not seriously altered; and especially if the malady has made but little progress, or the tumor is small, the danger is not so imminent, and the expulsion of the child may then take place regularly. But even where the delivery is effected spontaneously, its influence over the subsequent progress of the tumor is not the less disastrous; for the pressure to which the diseased part is exposed seems, in most cases, to hasten its development; and, whether the labor be terminated naturally or by the resources of art, its progress afterwards is much more rapid. The child, likewise, is very often lost in the cases under consideration; thus, of the twenty-seven women above cited, fifteen were delivered of a still-born child, and ten only of a living infant; nothing is said of the fate of the other two.

The indications for treatment, when the cervix uteri is affected with cancer, will necessarily vary, according to the seat and size of the tumor; for, if it is not very voluminous, or if it is located on the posterior lip, or the pelvis be of large dimensions, there is every reason for hoping that the efforts of nature will prove adequate to the dilatation, and the expulsion of the fœtus.

I have seen the former process effected at the expense of the sound anterior lip, where the other was invaded by a cancer throughout, which also extended to the posterior vaginal wall.[1] Wherefore, there is no occasion

---

[1] This case appears to me too remarkable not to be reported, at least in a condensed form.

A female aged forty-five years, who had previously had several children, came to the "Clinique" about the commencement of the last month of her gestation; when, by resorting to the touch, it was ascertained that the posterior vaginal wall was occupied throughout by an elongated tumor, which was curved in a serpentine form, and extended from the posterior lip of the cervix, to within a finger's breadth of the vulva. The lip was nearly an inch thick in [illegible]nt (which latter was for immediate action; although it must not be forgotten that, if the degeneration of these parts is more extensive, the powers of nature alone are nearly always inadequate to the accomplishment of the delivery.

Some authors have recommended copious bleedings; but sanguineous emissions, though advantageous in cases of rigidity, or of simple induration of the neck, would here only enfeeble the patient without producing any change in the condition of the orifice; and the only available resource of our art is still in the repeated incisions on the periphery of the cancerous mass; because turning, and the application of the forceps, which have been advised by certain accoucheurs, are evidently only practicable where the bistoury may have previously facilitated the entrance into the womb. Without this precaution, one or more fissures dividing the lobes of the scirrhus would naturally result from the introduction of the hand or instrument, which, at the moment of the head's passage, would extend still further, and encroach perhaps on the body of the womb. Or, if the fissures should not form, the neck, by not dilating, would create an obstacle to the delivery, and the patient would be exposed to a rupture of the organ, to convulsions, and to all the consequences that attend labors rendered difficult by mechanical impediments; unless, indeed, there happened to be a rupture of the subvaginal portion of the womb itself, and the child's passage was effected through this accidental orifice.

Lastly, in those cases where the application of the forceps is still impossible, even after the incisions have been made, a grave question is offered for our solution. Supposing the child is still living, we have only to choose between its mutilation and the Cæsarean operation. Though this last operation be serious under all circumstances, it nevertheless seems preferable here to the first, because it affords a considerable chance of saving the child; and the mother's life is already so greatly compromised by the disease with which she is affected, that we should not, in my estimation, hesitate to sacrifice all to the safety of her infant.

more considerable than usual), and it had contracted adhesions with the vagina by its posterior face. The tumor presented nearly the same thickness in all parts; its anterior surface was irregular and nodulated, as was also the posterior lip of the cervix uteri; but its hinder surface adhered to, or rather was confounded with, the recto-vaginal septum. When this woman arrived at full term, the labor began, and the dilatation was effected very slowly, though completely, at the expense of the anterior lip. The tumor whose volume seemed to offer an insurmountable obstacle to the delivery, only rendered the second stage of the travail a little more tedious than usual; for, being pressed back by the child's head, it became nearly transverse in the excavation, and formed on the perineum a pad, or a kind of crescent, the convexity of which looked downward, but its concavity was directed upwards, and arrested the head; finally, under the influence of the powerful contractions, the head pushed the tumor still more backwards, by forcibly depressing the perineum, and then passed in front of it, and soon cleared the external parts.

CHAPTER VIII.

OBSTACLES DEPENDENT ON THE BODY OF THE WOMB.

§ 1. Of Uterine Obliquity.

When studying the phenomena of gestation, we enumerated the various causes that forced the uterus to depart more or less from the direction of the pelvic axis; and we demonstrated that, under the influence of those causes, the womb very often inclines forwards and to the right during the latter months of pregnancy. It is not, therefore, of this right antero-lateral inclination we are about to speak, in treating here of uterine obliquity as a case of dystocia; because, where it is slight, and where it may be considered as a normal result of the development of the womb, it affords no obstacle to the parturition; but when the obliquity is more extensive, it may impede the spontaneous expulsion of the child, and will, therefore, claim our attention.

Deventer, and most of the writers on this subject since his day, have described four varieties of it, namely, the anterior, the posterior, the right lateral, and the left lateral obliquity. But the modern accoucheurs, such as Baudelocque, Gardien, Desormeaux, and P. Dubois, believe that a posterior obliquity cannot take place; for the prominence of the sacrum and of the lumbar vertebræ, they say, prevents the uterus from being carried backwards; however, from the facts reported by Deventer, Levret, Merriman, Dugès, and Velpeau, we feel warranted in still retaining these four varieties.

1. *Of the Anterior Obliquity.*—As a natural result of the resistance presented by the posterior abdominal plane, the womb inclines forward, where it only encounters the abdominal muscles, which form a soft and an extensible wall. When this obliquity is inconsiderable, the physician has only to remain a simple spectator of the efforts of nature; but when it exists in a higher degree, it becomes a source of annoyance and pain during the latter months of gestation that demands attention; and it also gives rise to difficulties in the course of the labor that should either be prevented or corrected.

An unusual inclination of the plane of the superior strait, or a well-marked laxity of the abdominal walls, favors the obliquity; and where this laxity is carried to an extreme, the ventral muscles gradually relax and yield, the womb inclines more and more forwards and downwards, its fundus gets above the pubis, and then falls anteriorly, like an inverted sack, on the thighs. This displacement has been designated as the *ventre en besace*, and by the Latin authors it is described under the name of the *venter propendulus*. This displacement gives rise to acute pains in the groins, in the fore part of the thighs and loins, when the abdomen is not supported by a proper bandage during pregnancy; and, at the time of labor, the cervix uteri is carried so far back against the anterior face of the sacrum, that it dilates with the greatest difficulty; and if the membranes be prematurely ruptured, or if the pelvis is unusually large, it nearly always happens that the child's head presses the anterior inferior part of the uterine wall before it; which part appears at the vulva while its orifice is directed considerably upwards and backwards. But if the pelvis be small, this engagement of the head does not take place, and the anterior uterine wall is then forcibly compressed between it and some portion of the superior strait. The enormous distention in the former case, and the pressure on the lower part of the uterus in the latter, expose this portion of the organ to laceration or gangrene. Under such circumstances, the abdominal exploration and the vaginal touch can alone explain the cause of the difficulties and pains which the patient experiences. The obliquity in the body is readily recognized by the external examination; and if the head be engaged in the excavation, the finger introduced into the vagina will find a voluminous, smooth, and rounded tumor, filling up the whole cavity of the lesser pelvis, and upon which no opening similar to that of the cervix uteri can be detected; but when carried further upward and backward towards the sacro-vertebral angle, it will reach (though at times with great difficulty) the anterior border of the cervix; but, most generally, it will be impossible to recognize the posterior lip. This circumstance has several times been mistaken for imperforation of the womb, or a complete obliteration of the neck, and, as a consequence, the vaginal Cæsarean operation has occasionally been performed, where nothing more than an obliquity of the uterus was to be remedied. If the head has not yet engaged, the tumor will not occupy the excavation, but the same difficulty will still be experienced in finding the cervix. Both of these modes of exploration should be employed; for we have already learned (p. 702) that the cervix may be oblique, while the body retains its natural position; and it is evident that, under such circumstances, a resort to the touch alone might lead us to suspect an obliquity that did not really exist; and, on the other hand, the internal exploration would guard against the errors that the deformed appearance of the woman's abdomen might possibly make us commit; for it alone can enable us to distinguish the obliquity from that deformity already alluded to, under the name of anteflexion, in which the womb is shaped like a retort. In the former case, the cervix will be detected high up towards the posterior plane of the pelvis; in the latter, on the contrary, it will correspond to the centre of the excavation, notwithstanding the great forward inclination of the body of the womb.

2. *Of the Posterior Obliquity.*—This variety of obliquity (which is denied, as above stated, by most modern authors) must be attributed to an excessive resistance on the part of the abdominal walls, which prevents the uterus from following the direction of the axis of the superior strait, when it rises out of the pelvis; that is, from inclining forwards, and therefore it is almost exclusively met with in women bearing their first child.

The direction of the uterine axis is not to be judged of in reference to the axis of the body, but to that of the superior strait. Now, it is undeniable that the womb, in some cases, instead of being directed from above downward and from before backward, has its long axis directed from behind forward, and sometimes even in a direction parallel to the plane of the superior strait, so that, while its fundus reposes on the posterior inferior plane of the abdomen, its neck is situated above the pubis.

[Deviation of the orifice toward the pubis undoubtedly takes place in a certain number of cases. We admit willingly, however, that instead of regarding it as due to obliquity of the uterus, it were better explained as produced by an irregular development of the organ, whose posterior half was extremely depressed, the anterior portion having resisted.]

I cannot better describe the signs appertaining to this particular obliquity than by relating a few examples of it; and these citations will have the further advantage of verifying the fact, and of establishing its possibility.

I have twice had, says Merriman, from whom I extract the following case, an opportunity of observing this singular and unusual position of the uterus, in which the os uteri is carried so far above the symphysis pubis that it is inaccessible to the finger, and the posterior part of the pelvis so completely filled by the body of the womb that it is impossible to touch the sacrum. A case of the kind has been published by Dr. S. H. Jackson; but it occurred in a woman who had not reached full term. In the first of my cases, the woman was at term, and the labor continued for several days; but the uterus regained its ordinary position after severe efforts, and the labor terminated spontaneously: the child was still-born, but the mother recovered. The other was published a long time ago, in a dissertation on retroversion of the womb, which has been sharply criticised by Dr. Dewees. The following is an abstract: "Mrs. F—— was taken with symptoms of labor, on Monday, June 16, 1806, at which time a discharge of the liquor amnii was perceived, and severe and apparently strong pains recurred at distant intervals. In the course of the day, the patient was examined per vaginam, when there appeared to be a singular condition of the part. The whole of the back part of the pelvis was filled up by a globular tumor, which prevented the finger from passing in the direction of the coccyx and sacrum, but it was obliged, in tracing the tumor, to take a direction towards the ossa pubis, above the crest of which it could be passed; but neither here nor anywhere else could the os uteri be felt.

"By introducing the finger into the rectum, it appeared that the tumor was uterine, and that some bulky part of the fœtus was contained within it; but whether the nates or the head, could not be clearly distinguished.

"On Tuesday, the 17th, the discharge of liquor amnii continued; the pains were frequent and excruciating, and the tumor was pressed down closer upon the perineum. A rigor, terminating in convulsions, and followed by fever and delirium, took place this day; but a prompt bleeding and evacuating the bowels relieved these symptoms.

"Wednesday, 18th, and Thursday, 19th, no material alteration was observed. The pains continued regular and distinctly marked through these days, but were much less severe and distressing than at first.

"Friday, 20th, another very careful examination of the parts was made. The uterine tumor presented the same shape and bulk, quite obstructing the passage towards the sacrum, for even the coccyx could not be felt, except the finger was introduced into the rectum; when the finger in the vagina was carried forward, in the only direction in which it could pass, namely, anteriorly, it reached above the pubes, but still the os uteri could not be felt; yet, on withdrawing the finger from above the symphysis pubis, there was now, for the first time, perceived upon it the true appearance of a show, which furnished a convincing proof that the os uteri was situated in that direction, and encouraged us to hope that an alteration in the state of the uterus was at hand.

"Our hopes were not vain; for, on the next day, Saturday, 21st, a considerable alteration was discovered in the pains, and in the situation of the globular tumor, which occupied the pelvis. The pains were more powerful and effective, and the tumor, which had been contiguous to and pressing upon the perineum, was found to have a little receded, while a flattened mass (which proved to be the head of the child in a state of complete putrefaction, with the bones separated, and the brain almost dissolved) was forced down from above the pelvis, between the ossa pubis and the uterine tumor.

"After a few hours of active pains, the tumor ascended above the brim of the pelvis, and was no longer to be felt; but now the os uteri was easily distinguishable, though still very high.

"It was judged right to make an opening into the head, and about a pint of grumous blood and brains was evacuated; this allowed an opportunity of grasping the scalp, and by means of this so much assistance was afforded in extracting the child, that the labor was terminated in a few more pains.

"The patient perfectly recovered, and lived many years afterwards in good health, but never had another child." (*Synopsis.*)

"In a woman," says M. Velpeau, "who came to be confined at my amphitheatre, in the month of May, 1828, the fundus of the uterus was rather inclined backwards than forwards. The head of the fœtus formed above the strait a considerable projection, which descended in front of the symphysis pubis nearly to the vulva. Besides, the walls of the abdomen were so thin that the head, fontanelles, and sutures could readily be detected through them: the occiput was to the right, and the face to the left. The right parietal bone rested against the anterior face of the symphysis pubis, and the left remained in front. The os uteri, which was on a level with the superior strait, seemed to be scooped out of the substance of the posterior wall of the womb, which made it much longer behind than before. In order to reach the orifice, and penetrate towards the head of the child, I was obliged to bend my finger, so as to make it pass almost horizontally above the pubis. After seven days of pain and pretty strong contractions, the os uteri, although very soft and very dilatable, was scarcely opened at all. M. Desormeaux agreed with me, that by means of position, and the assistance of the hand properly combined, I ought to try to carry the head to the centre of the superior strait, by making it slide from below upwards, and from before backwards over the pubis. I began to execute this manœuvre at half-past eight o'clock, and continued it, alternating with several of the students, until nine o'clock. From this time there was no longer a tumor in front of the symphysis, and the labor progressed so rapidly that in less than an hour the child was born, and the placenta itself expelled." (*Meigs's Translation*, p. 404.)

Dr. Billi, Professor at Milan, reports a case (*Ann. de Chir.*, 1845, p. 113) in which the retroversion was so complete, that the orifice was situated five fingers' breadth above the pubis, whilst the posterior part of the excavation was occupied by the head of the fœtus. The fundus of the uterus, in the shape of a hard and rounded tumor, was situated between the vagina and the rectum, which it compressed violently.

I might also add similar examples from Dugès; but these two are probably quite sufficient to render what is meant by the posterior obliquity of the womb fully understood.

By summing up the symptoms so well described by Merriman, we shall have: 1, a very considerable elevation of the os uteri, which is carried high upward and forward above the symphysis pubis; 2, a tardy dilatation of the cervix; 3, the tumor, constituted by some part of the fœtus (the shoulder, probably) pressing before it the posterior inferior portion of the womb that envelops it, is strongly engaged in the excavation, and occupies all the cavity of the lesser pelvis;[1] and, 4, the head situated above the symphysis pubis. By collecting in the same way the principal characters of M. Velpeau's case, we shall find a remarkable elevation of the presenting part; a very unusual elevation of the cervix uteri, the orifice of which, being turned directly forward, is placed above the symphysis, and is scarcely accessible to the finger; and, lastly, a considerable tumor formed by the child's head, just in front of the anterior face of the symphysis. And we may add, that such a tumor had previously been described by Dugès, in several of his observations.[2]

The posterior obliquity of the womb is rarely so disastrous in its consequences as Merriman's case proved to be; for most generally the strong contractions of the organ, the energetic efforts of the patient herself, and a sufficient amplitude of the pelvis, succeed in overcoming its unfavorable influence, without extraneous aid; and, besides, it often happens that, at the time the membranes are ruptured, the head descends into the excavation along with the discharged waters. But on the other hand, as in the instance of the author just quoted, the deviation of the fœtus, and of its presenting part, goes on increasing, and then it may require version.

[We have stated that all difficulty in accounting for the way in which posterior obliquity takes place is removed by regarding it as a result of irregular development of the uterus, the excessive dilatation of whose posterior segment pushes the cervix forward. That Prof. Depaul accepts this view is shown by the following case. A lady from the country, who had already borne children, was at the period of her confinement; pains had been experienced for several days, but the labor had made no progress. When M. Depaul was called he found no appreciable inclination of the uterus. On making an examination, the finger encountered quite a large tumor occupying a part of the cavity of the pelvis, more especially the posterior portion. The neck was thrust forward and lodged behind the symphysis pubis. It had the form of a transverse fissure, with two projecting lips, and its cavity was not blended with that of the body of the uterus. On passing the finger between these lips, it was found that the internal surface of the anterior one presented a concavity looking backward. The posterior one was swollen at its upper extremity, and had, on a level with the internal orifice, a transverse, rounded projection, a little convex in front. The swelling seemed to be about the size of a finger, extremely hard and tense, like a contracted tendon. M. Depaul succeeded in hooking his finger around this part, and thus became satisfied that it was formed by the posterior half of the internal orifice, whose fibres had become hypertrophied and contracted. He also found that the uterine cavity, in consequence of an abnormal development posteriorly, formed a sort of bag, which hung far below the neck, and in which a part of the breech was engaged. Incisions of only three or four sixteenths of an inch in depth were made to the right and left on the internal orifice, when the neck immediately opened, allowing the operator's hand to pass readily into the uterus and seize the pelvic extremity. A very large fœtus, in process of decomposition, was easily extracted, and the patient recovered rapidly.

---

[1] It is highly probable that the engagement of the shoulder in the excavation is owing to the putrefaction of the fœtus. Merriman has not noted the prominence formed above the symphysis pubis by the head; the absence of this projection, which was so remarkable in M. Velpeau's case, was certainly due to an engagement of the shoulder, and the head was probably thrown back on the opposite one, so that a spontaneous cephalic version took place.

[2] It has been remarked, in many cases, that the child's head presented, after birth, a red longitudinal mark between one of the parietal protuberances and the sagittal suture. This long, narrow track seems to be owing to the contusion made on the scalp by the upper border of the pubis. In a case of this kind, reported by Paisley, the midwife could not detect the child's head until after the discharge of the waters. The head would not descend, and the woman died of exhaustion; and [illegible]opsy, the frontal and parietal bones of the right side were found [illegible] his, which had made a depression there of one or two in[illegible]

What was the difficulty in this singular case? Both MM. Devilliers and Depaul regard it as an extreme development of the posterior portion of the inferior segment of the uterus, in connection with another peculiarity not always met with, viz., hypertrophy and tension of a portion of the circular fibres situated at the internal orifice. (*Bulletin de l'Académie de Médecine*, 1865.)]

3. *Lateral Obliquities.*—For the reasons formerly given (page 702), the right lateral obliquity is far more frequent than the left; indeed, but very few examples of the latter are ever met with. These variations in the direction of the uterus are rarely of such a nature as to constitute a serious obstacle to parturition; they act more particularly in modifying, and sometimes even in altogether changing, the presenting part of the fœtus. Let us suppose, for instance, says Dugès, that the womb be oblique enough to carry the child's head towards the border of one of the iliac fossæ, as I have seen in two cases; but it can hardly remain at this point, for it will either be pressed back into the excavation, or else it will slip further forward and outward, and the child, by thus becoming more and more oblique, will ultimately present one or the other shoulder at the superior strait.

4. *Treatment of Uterine Obliquity.*—In a large majority of cases the obliquity of the womb, whatever may be its variety, presents no special indications for treatment; it constitutes a source of delay in the progress of the parturition, but it scarcely ever becomes a serious cause of dystocia. Consequently in these, as in all other slow labors, the first duty of the practitioner is to *wait*. In some very rare instances, where it happens that an excessive degree of obliquity is not rectified under the influence of the powers of nature, the intervention of art becomes necessary; and the indications then presented are,—to restore the womb to its normal position, to sustain it there, and to remedy any accidents that may happen.

The measures whereby the first two indications may be fulfilled, are perfect rest on the back, when the obliquity is anterior, or on the side opposite to the one occupied by the fundus uteri, when it is lateral, and the employment of the hands to support and maintain the deviated organ, or of a large bandage properly applied, to produce the same effect. The patient should be advised not to bear down until after the displacement is remedied. If these means are not sufficient, it will be necessary, while thus operating externally on the body, to act at the same time on the neck; for that purpose introducing two fingers into the uterine orifice, and taking advantage of an interval between the pains to draw it gently towards the centre of the pelvis, whilst the other hand is employed in pressing the fundus of the organ in the opposite direction.

These measures generally succeed, and their use should be continued as long as the double interest of the mother and child will permit; but if they prove unsuccessful, and the reduction of the obliquity and the delivery becomes impossible, our only resource is to open an artificial passage, by making an incision into that portion of the uterine wall which projects into the vagina (the vaginal Cæsarean operation). Still this ought to be considered an ultimate resource, and one not to be resorted to until after the impossibility of introducing the hand into the uterus to effect the pelvic version has been fully ascertained.

In the posterior obliquity, the woman ought to remain seated or standing, or, if possible, even reclining a little forward. If the head forms a projection above and in front of the pubis, as in the case of Velpeau, and those reported by Dugès, the hand should support the hypogastrium, and, by perseverance, it will succeed in pressing back the head to the centre of the excavation. This manœuvre will be rendered more easy by the vertical position, by walking, or, if necessary, by the woman's resting on her hands and knees, so that the fundus of the womb will hang forward, as it were. A kind of see-saw movement then takes place, which, by depressing the part of the child that occupies the fundus, elevates that near the neck. Finally, should all these plans fail, the pelvic version must be resorted to.

§ 2. Of Hernia of the Womb.

Most of the cases of hernia of the womb may be referred to what we have described under the name of anterior obliquities of this organ. These are true *eventrations*;[1] and it is exceedingly rare for the uterus, by escaping through one of the natural openings of the abdomen, such as the inguinal or the crural rings, to constitute a hernia, properly so called. Some well-established examples of it, however, are found in the books; for instance, Simon, in his Memoir on the Cæsarean operation, and Sabatier, in his work on the displacements of the womb and vagina, both of which are found in the valuable collection of the Académie de Chirurgie, have related several very curious instances of the kind.

In most cases, the displacement of the womb had existed prior to the fecundation, and the organ thus situated without the abdominal inclosure, continued to be developed until full term. In some others, which are more difficult to admit, this organ having attained a certain degree of development, gradually dilated one of the crural or inguinal rings, and constituted an external hernia. These latter have been admitted by Desormeaux, but they are rejected by M. Moreau, who considers them as genuine eventrations, and we are disposed to adopt the latter view, at least so far as regards the case reported by Ruysch. Sometimes, however, the existence of an old hernia has occasionally seemed to favor the development of a hernia of the uterus.[1]

---

[1] A term applied to the hernias following any accidental opening in the abdominal walls; as also the falling of the belly, resulting from an extreme relaxation of the anterior ventral walls.—*Translator.*

The characters of this latter, during the gestation and labor, are too well marked to require a detailed account of the signs of recognition. But, at the time of the parturition, the inefficiency of the efforts of nature should be fully tested by a prolonged delay, before resorting to the Cæsarean operation, which is the only resource recommended by very many accoucheurs; for, in some cases, the labor has been known to terminate spontaneously. In a case related by Ruysch, a midwife, by raising the tumor, succeeded in returning the fœtus into the abdomen, and the delivery was effected as usual.

§ 3. Of Prolapsus Uteri.

It is possible for a prolapsus of the womb to exist in a non-pregnant woman, and yet the latter may conceive, as is fully proved by the following observation of Marrigues, reported by Chopart. "A female, who was affected with a prolapsus, had been impregnated by the direct and immediate introduction of the fecundating principle into the uterus, through its gradually dilated orifice." The conception having once taken place, the uterus may go on developing until term, and at the time of labor may present an enormous tumor hanging between the thighs; or this falling may only occur during the gestation; and again it may suddenly come on in the course of the parturition, where the patient is abandoned to herself, or is attended by inexperienced persons, who allow her to remain standing or walking for a long time, or who permit her to make strong bearing-down efforts, with a view of hastening her delivery before the os uteri is sufficiently dilated.[2]

---

[1] One Ramus, aged twenty-four years, and having borne six children, had a right inguinal enterocele, which appeared some time before her marriage. At the third month of a seventh pregnancy she was attacked by an annoying, dragging sensation on the left side of the hypogastrium. The tumor hitherto observed in the latter region disappeared, and she discharged blood by the vagina. By placing her hand over the inguinal hernia, she discovered there a hard and strange body, that was painful on pressure, and which she several times attempted to push back again, without success. Several weeks afterwards she felt some movements at that point, and sent for a physician, who detected at the lower and right portion of the abdomen a tumor, that descended on the thigh of this side, covering the pubis, and even extending across as far as the left thigh; this tumor was twenty-six inches in circumference at the middle, and twenty-four inches at its junction with the abdomen. Several attempts at reduction were made without effect. The pains came on at the eighth month, and hysterotomy was then performed, but the reduction was still impossible after the delivery, and the uterus was left on the exterior. Both the mother and child were saved. (*Ledisma de Salamanca; Gaz. de Méd.*, 715, 1840.)

[2] According to M. Moreau, the patients are particularly exposed to this kind of displacement in the five or six weeks following the delivery. The uterus, which had been distended by the product of conception, still infiltrated by fluids, hypertrophied in a measure, has a much larger size and a far more considerable weight than usual; the ligaments that were stretched have regained as yet neither their consistence nor habitual strength. Now if, on the one hand, there is more weight in the organ to be sustained, and, on the other, greater weakness of the ligaments which should sustain it, it is very apparent that a cause which, in the ordinary conditions of life, would be insufficient to bring about a displacement, will produce it under the circumstances

The prolapsus may prove a source of serious difficulty in the progress of the parturition, for experience has shown that this accident may not only be productive of long delays, but likewise of real danger; perhaps, it may even render the spontaneous expulsion of the fœtus altogether impossible, either (as has long since been remarked) because the womb, which has descended to the lowest part of the abdomen, and possibly even beyond the abdominal inclosure, is removed, as it were, from the influence of the contractions of the abdominal muscles; or because, being wedged in between the surface of the child's body and the walls of the pelvis, it has lost a great part of its energy in consequence of the long-continued pressure.

The difficulties to be overcome will also vary according to whether the prolapsus be recent or of long standing; for, in the latter case, the prolonged contact of the organ with the internal face of the thighs, and with the dress, may have produced a state of induration of the cervix which opposes its steady dilatation; indeed this has often been impossible, and the physician has been obliged to incise it to overcome the resistance offered by the indurated parts. On the contrary, where the accident has recently occurred, or, still better, if it is only manifested during the labor, the dilatation of the os uteri is sometimes effected spontaneously; and the duty of the accoucheur is then limited to facilitating it by the use of the appropriate means.

The special indications presented by a falling of the womb, when it occurs during pregnancy, have already been treated of. (Page 528.)

All attempts at reduction would be dangerous during the labor; and, consequently, the accoucheur must then be satisfied with hastening the dilatation of the os uteri as much as possible, and with preventing the lacerations it would suffer, by suitable incisions, in cases of induration.

The delivery of the placenta likewise demands much circumspection, since it is evident that we cannot trust its expulsion to nature, and still less can we draw on the cord in the usual manner; hence, the after-birth must be artificially separated. Immediately after its delivery the uterus retracts, and then its reduction is often quite easy.

[§ 4. Tumors of the Body of the Uterus.

Puchelt mentions ten cases of cancerous degeneration of the body of the uterus, the neck being healthy. In one case, the entire body of the organ was diseased. As these tumors rarely present any mechanical obstruction to the expulsion of the child, we will merely observe that they interfere with the contractions of the uterus and predispose to its rupture.

Fibrous tumors are by far the most common. They are distinguished according to their situation as sub-mucous, interstitial, and sub-peritoneal. All these may interfere with delivery by disturbing the regularity of the contractions of the uterus, but chiefly by obstructing mechanically the expulsion of the fœtus.

The fibrous masses, whether pediculated or not, which grow upon the segment of the uterus, may be assimilated to the same kind of tumors and polypi of the neck. We have, therefore, nothing to add to what has been already said in regard to them. (See *Fibrous Tumors of the Neck*, page 706.)

Fibrous tumors of the upper segment are grave in proportion to the length of

just indicated. For these reasons, therefore, we cannot too strongly urge the patients to keep in the horizontal position during the early part of their lying-in, and to avoid all kinds of violent exertions for the first six weeks following their delivery.

their pedicles. When non-pediculated and situated in the fundus, they have no tendency to engage in the cavity of the pelvis below the head of the fœtus; whilst those with long pedicles attached at the fundus, may form serious obstacles should their lower extremity become engaged below the head. In the latter case, the only thing to be done is to divide the pedicle and remove the tumor.

All sub-mucous fibrous tumors are liable to cause hemorrhage during the delivery of the after-birth, because their size interferes with the contraction of the uterus. An unusually severe hemorrhage may also result from a direct insertion of the placenta upon the portion of mucous membrane covering the tumor. It will be readily seen how this unfortunate disposition of the parts might facilitate the loss of blood from the open orifices of the utero-placental vessels, which remain unclosed because the tumor obstructs the contraction of the muscular fibres.

The peculiar changes which occur at the internal surface of the uterus after delivery, often have a singular effect upon the continuance of sub-mucous fibrous tumors. There are cases which prove that the uterine mucous membrane may undergo ulceration, and the tumor thus exposed become enucleated, so to speak, and expelled into the vagina. I have myself seen two cases of this sort of spontaneous cure.

Sub-peritoneal fibrous tumors are generally less grave than the sub-mucous variety, yet they may prove a very serious obstacle should they happen to occupy a part of the cavity of the pelvis. I reported in my thesis for the *Concours*[1] a case furnished me by M. H. Blot, and of which the following is a summary. A woman from Argenteuil was brought to the hospital of the Clinique after fruitless attempts had been made to deliver her. It was a shoulder presentation and the left hand and a loop of the cord hung from the vulva. The turning was very difficult and the head was momentarily arrested at the superior strait which it cleared suddenly. The patient died of metro-peritonitis, and the autopsy revealed the presence of three fibrous tumors. One of them was attached to the middle of the posterior

FIG. 110.

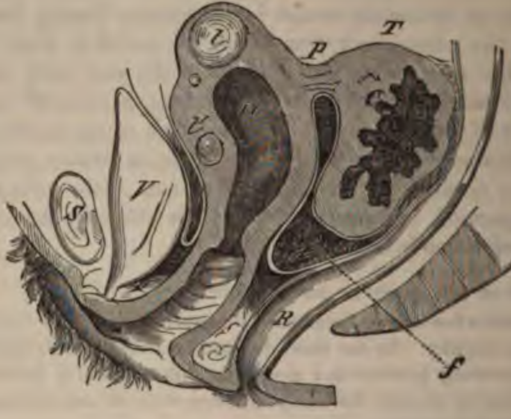


FIG. 110. Section of the fibrous tumor.

S. Symphysis pubis. *V.* Bladder. *t.* Small fibrous tumor. *t'.* Another small fibrous tumor. *T.* Principal tumor. *c.* Central cavity of the tumor. *r.* Rectum. *f.* Utero-rectal cul-de-sac. *p.* Pedicle of the tumor where it is attached to the posterior surface of the uterus.

---

[1] Tarnier, *Cases in which it is necessary to extract the Fœtus.* Paris, 1860.

surface of the uterus by a pedicle of over two inches in length, which soon enlarged to a volume greater than that of the head of a fœtus at term. It filled the utero-rectal cul-de-sac, projected above the superior strait and reached the fundus of the uterus. At numerous points it was adherent to the recto-uterine cul-de-sac. An antero-posterior section having been made, it was found that the centre of the tumor was broken down into a pulpy mass of a grayish color. (See Fig. 110.)]

CHAPTER IX.

OF TUMORS APPERTAINING TO THE ADJACENT PARTS AND CELLULAR TISSUE OF THE CAVITY OF THE PELVIS.

THESE tumors are various in character and may appertain either to the ovary, Fallopian tube, bladder, intestine, or cellular tissue of the pelvis.

§ 1. TUMORS OF THE OVARY.

This organ may be affected with a number of diseases, nearly all of which have the effect of singularly augmenting its volume; thus cysts, distended with solid or liquid matters, are frequently observed there, and abscesses have also been met with; or this body itself may become hypertrophied, or be affected with scirrhous or encephaloid cancer. But we shall not treat of these latter affections, further than to examine the influence they may have over the puerperal functions. In this respect, it is highly important to ascertain the exact seat of the tumor; for sometimes the diseased ovary remains in the abdominal cavity above the superior strait; and, again, it is very often displaced, and falls into the pelvic excavation. In the former case it may, doubtless, obstruct the development of the uterus by its bulk, and thus bring on a premature labor; or it may produce an obliquity of the womb by pressing the latter to the opposite side, and thus prove a source of dystocia; but it particularly claims the attention of the accoucheur when situated in the lesser pelvis; for it may then so obstruct the passages, that a natural delivery of the child becomes wholly impossible.

The tumors, constituted by the displaced ovary, nearly always fall down into the cul-de-sac, formed by the peritoneum, it being reflected from the posterior surface of the uterus to the anterior one of the rectum. In a single case only, reported by Jackson, has it been found behind the rectum, which latter was then pressed forward. This singular anomaly merits attention.

The ovarian tumors vary greatly, both in their volume and form — from the size of a small orange up to that of a child's head; sometimes they only occupy a part of the excavation, while at others, they fill it up so completely that the finger can scarcely be introduced between them and the pelvic walls. It is important in practice to ascertain these differences of size and location, and equally so to detect the nature of the tumor, and the kind of material that forms it. In some cases of ovarian dropsy, the fluctuation is so evident that no possible doubt can exist concerning its character, but in others, this sensation is not so clearly recognized; though here the smooth and polished surface of the tumor, and its rounded form, compared with the irregularities, and the nodules exhibited by cancerous degenerations of this organ, will facilitate the diagnosis. The density of the fluid tumor, its elastic resistance and fluctuation, are singularly modified during the contraction; because, being then strongly compressed by the child's head, the sac, that was at first soft and yielding, becomes hard, tense, and resistant; consequently, it is advisable to examine both during and after the pain, for the differences then presented will likewise aid in making out the diagnosis. The exploration should be made both by the vagina and rectum, since this is the best method of distinguishing the enlargements of the ovary from those belonging to the uterus or the vagina. This double exploration only admits of their being confounded with the tumors existing in the recto-vaginal septum; but this error would be of little consequence, since the two cases present the same indications for treatment.

The presence of such tumors is always a very unfavorable complication of the labor; but the prognosis will necessarily vary with their volume, seat, nature, and mobility, as also according to the period at which the physician is summoned. Thus, in thirty-one cases recorded by Puchelt, fifteen were fatal to the mother and twenty-three to the child. Twenty-one children and one woman died during the labor.

As regards the treatment, the same course is not always to be pursued in the cases under consideration. There is evidently nothing to be done where the size and locality of the tumor afford a well-grounded hope of a spontaneous delivery; but when it is movable, and the head has not yet engaged, it is recommended to attempt to press up the former above the abdominal strait; and, should the tumor still have a tendency to fall back, after having been carried up, it ought to be supported, while the feet are sought after, or an application of the forceps is resorted to.

But in some grave cases, the engagement of the head, or the adhesions of the tumor, render a return of the latter impossible; here it is particularly important to be certain of its nature; and if the signs above indicated have not proved sufficient to settle the diagnosis, a puncture should be made in it, which would determine the question of its fluidity or solidity. If it proves to be an ovarian dropsy, it is to be evacuated by a trocar somewhat larger than the one used for the exploratory puncture; but if the cyst be multilocular, or if it contain a cheesy matter that cannot escape through the canula of the trocar, a free incision will evidently be requisite.

By allowing the fluid to escape, the incision would have the double advantage of facilitating the labor when the tumor is very large, and of preventing consecutive inflammation of the cyst, when the latter, though too small absolutely to prevent the expulsion of the fœtus, is yet large enough to delay it greatly. Under the latter circumstances, indeed, the compression it undergoes during labor may excite in it a violent inflammation, and, in some cases, even produce a rupture. As a consequence of this rupture, the fluid may be discharged externally through a perforation of the vagina, or be effused into the cavity of the peritoneum.

The incision or the puncture is usually made by the vagina, as the evacuation of its contents is more easily effected through this canal. Some persons, however, fearing lest an incision made through the vaginal wall might become enlarged at the moment of the passage of the head, have recommended the introduction of the instrument through the rectum; and although this mode of operating ought, in general, to be rejected, it should certainly be followed in those cases in which the tumor is located between the posterior part of the rectum and the anterior surface of the sacrum.

Again, the tumor is solid, it cannot be pushed up, and the size is so great as to render an extraction of the fœtus altogether impossible. The case is then most serious, and we have only to choose between an extirpation of the tumor, or a resort to embryotomy, or to the Cæsarean operation. Under such circumstances, if it were possible to ascertain that the abnormal growth had not contracted intimate adhesions to the neighboring parts, I would willingly adopt the views of Merriman, who recommends its extirpation; but if this latter be deemed impracticable, a mutilation of the child might be resorted to, when there is room enough between the tumor and the pelvic wall to afford a passage to the fœtus grasped by the embryotomy forceps; otherwise, the Cæsarean operation seems to be the only resource.

The following summary, which will serve to illustrate the danger of the operations just recommended, is extracted from M. Puchelt's statistics: In five cases, where the delivery was abandoned to the resources of the organism, four of the mothers died, and but two children were born living. The simple pushing up of the tumor was only followed by the safety of both individuals in a single instance, while in another case the infant was stillborn. Version was performed twice, after having previously pushed up the tumor, but this double operation was only once successful for the woman; the child, though born living, died immediately afterwards; but in the other, both mother and child perished. A simple puncture of the tumor was attended with success in one case, though in two others it did not obviate the necessity for embryotomy, and both women died. The incision of the mass, which was practised in three instances, was favorable to both individuals in a single case only, while in the other two the children perished; in the fourth, version was effected after the incision, but both mother and child were lost; the same result attended the application of the forceps in one case; a perforation of the cranium was found necessary in six, and only three of the women recovered; and, finally, both parties survived in those instances where the blunt hook could be employed.

§ 2. Tumors appertaining to the Fallopian Tube.

As the tumors of the tube are much more rare than those of the ovary, they seldom constitute a mechanical obstacle to the delivery. In fact, only one case of the kind is on record, that related by Chambry of Boulaye, in the old *Journal de Médecine, Chirurgie, et Pharmacie.* It appeared as a round, hard, irregular, and partly osseous tumor, the true seat of which was subsequently ascertained by the *post-mortem* examination. If a similar case should be met with, it would offer the same indications for treatment as the ovarian tumors.

§ 3. Tumors of the Rectum.

A. Fecal matters may accumulate and harden in the rectum, and give rise to unpleasant symptoms, which sometimes [illegible] regular disease of the intestine; and if such an accumulation takes place towards the end of pregnancy, it may render delivery difficult, or even impossible, by obstructing the passages the fœtus has to traverse. In several of the reported cases, injections could not be made, and laxatives given by the mouth proved ineffectual. For instance, Guillemot says, "We are constrained, before delivering her, to extract all the excrements which distended the said large bowel;" and Lauverjat likewise remarks, "I introduced my finger into the vagina, and pressed on the matters, with the view of diminishing their solidity; I then gave two injections, which soon emptied the intestine; the pains, which had been completely suspended for six hours, reappeared, and the labor was terminated in less than fifteen minutes." Under like circumstances, I know of nothing better than to follow the example of these practitioners.

A curious case, in many respects, is reported by Fournier, who says: "I was sent for by three surgical students, who had been ineffectually attempting to deliver a woman for five days. Having ascertained, on my arrival, that she was costive, and had not had a passage for a week, I immediately directed an injection. The student charged with this duty endeavored in vain to find the anus; and, on going to his aid, I discovered that it was imperforate, and that no vestige whatever of an orifice remained; but, instead, a line similar to the raphe extended from the coccyx to the vulva. I introduced my finger into the vagina, where I found the rectum floating, and as it was filled with excrement, compressing the womb, the canula was introduced there, and the injection penetrated into the intestine, from whence a prodigious quantity of cherry-stones, mixed up with fecal matters, came away at once; and after this evacuation, I terminated the labor." (*Dict. Sci. Méd.*, tom. iv. p. 155. *Cas. rares.*)

B. *Scirrhus.*—Dr. Lever relates having met with a case where the labor was rendered difficult by the presence of a cancerous tumor situated three inches above the anus. But such tumors rarely acquire a large size, and the application of the forceps would nearly always prove sufficient to overcome the obstacle.

§ 4. TUMORS OF THE BLADDER.

The tumors in the pelvic cavity, dependent on the bladder, may be caused either by a procidentia vesicæ, a cancer of this organ, or a urinary calculus. In addition to which, we have elsewhere spoken of the unfavorable influence that an excessive distention of the bladder might have over the puerperal functions.

A. *Procidentia Vesicæ* (Falling of the Bladder).—Under this title, certain authors have described an inconsiderable displacement of the bladder, but which does not the less constitute a true hernia of the organ; and we shall, therefore, refer our remarks on this subject to the article in which hernial tumors are treated of in detail.

B. *Cancer of the Bladder.*—Puchelt extracts one case of this disease from Oberteufer, and Dr. Lever reports another; both of which would seem to prove that the vesical walls, when attacked by cancer, may form a tumor in the excavation large enough to obstruct the course of parturition. As to its treatment, this tumor evidently presents the same indications as all the other solid ones before described.

c. *Urinary Calculi.*—Instances of a stone in the bladder descending into the excavation, and thereby obstructing the free passage of the head, are not very unusual. The numerous cases of this kind on record prove that they are always situated below the head, or else are placed between it and the symphysis pubis. In a single instance only, reported by Lauverjat, the calculus was above the pelvis, though, as M. Velpeau remarks, it is difficult to understand how it could then arrest the expulsion of the fœtus.

Calculi vary very much in their size, and the same is true of their shape, which fact modifies the prognosis. The diagnosis is not always an easy matter, though if the tumor felt behind the symphysis pubis is hard, circumscribed, and gives rise to pain when pressed upon by the finger or the child's head, if it is situated without the vagina, and if it is firmly fixed during the contraction, but is movable during the relaxation of the womb, there is every reason to suspect the existence of a calculus; which suspicions would naturally lead us to the use of the catheter, whereby the foreign body can nearly always be detected.

Treatment.—An attempt should be made to press up the stone above the superior strait, before or even during the labor, and prior to the engagement of the head; or, if the latter is still movable—although it may be engaged—it should be raised up from the strait, and the calculus be pushed above it. But, unfortunately, it is not always possible to do this, either because the head has descended too far to be pressed back (the stone being below it), or because this latter is forcibly wedged in between it and the symphysis. In such cases, an extraction of the calculus seems to be the only resource; however, this need not be attempted at once, for some of the reported facts would seem to prove that its spontaneous expulsion may take place, even where its great size might preclude all hope of such an event, as occurred in the following case reported by Smellie. The wife of a coal-porter, who had long been suffering from the presence of a stone in the bladder, became pregnant. The midwife, summoned at the time of labor, was surprised to find a hard resistant body lying before the head; but as the means of the patient did not admit of her sending for a physician in consultation, the midwife could only keep up the spirits of her patient during the long and painful parturition. At last, she felt something coming away, which proved to be a stone about the size and shape of a goose's gizzard, and which weighed from five to six ounces. Immediately after its escape, the child was expelled, and the woman recovered in due time, but she afterwards suffered from incontinence of urine. Some surgeons have been encouraged, probably by facts of this kind, to attempt an extraction of the calculus through the previously dilated urethra; but this operation requires too much time to admit of being performed during the progress of parturition. If there should be no hope of succeeding by the forceps or pelvic version, on account of its large size, it would be necessary to resort to the operation of vaginal lithotomy, and incise the urethra directly on the stone through the anterior vaginal wall.

§ 5. OF HERNIAL TUMORS.

A considerable portion of the intestine, omentum, or bladder, may become engaged in one of the culs-de-sac formed by the peritoneum, in being reflected from the bladder to the womb, and from the latter to the rectum, and thus constitute a true *vaginal* hernia. But when the parts that are displaced and engaged between the rectum and the vagina descend still more, and cause a prominence in the perineum, the term *perineal* hernia is applied.

Under the title of *vagino-labial* hernia, a tumor has been described which is situated in the substance of the labia, or in the lowest and most projecting part of the fold which it forms with the skin.

A. *Intestinal or Omental Hernia.*—The seat of a vaginal enterocele, or epiplocele, is sometimes between the vagina and bladder, but oftener between the rectum and posterior wall of the vulvo-uterine canal, and always on one side of it, in consequence of the vaginal adhesions both behind and in front. The misplaced organ forms a tumor there which is very variable in its size, and which either presents the clammy softness of epiplocele, or the elasticity or rumbling of an enterocele. Though easily recognized, these tumors have, in some instances, given rise to serious mistakes, which might have proved disastrous to the patient. I was summoned, says Levret, to a case of this kind, where the question was actually discussed, whether a large portion of the tumor should be removed or not; but I demonstrated, in a satisfactory manner, that some part of the intestine had slipped down into the substance of the septum, through the bottom of the cul-de-sac that is found between the neck of the womb and the upper part of the rectum. (Levret, *Abus des règles.*)

The prognosis is unfavorable, not only from the obstacle thereby created to the expulsion of the child, but also from the pressure of the head on the hernial sac; because an inflammation, that is always serious, and which might sometimes even terminate in gangrene, may result in consequence. All authors have, therefore, recommended the reduction of the hernia as soon as possible.

To accomplish this, it is better to place the woman on her knees and elbows, so as to facilitate the return of the intestine and the engagement of the head; this position was followed by the happiest results in the case above reported. In another instance, Stubbs, by compressing the hernial tumor, succeeded in reducing it, and the head then engaged. In my estimation, the taxis should be preferred to Levret's method, taking care to sustain the head at the same time with the other hand, if the hernia be voluminous. Where the reduction is impossible, it is necessary to terminate the labor as soon as possible by the aid of the forceps, or by turning.

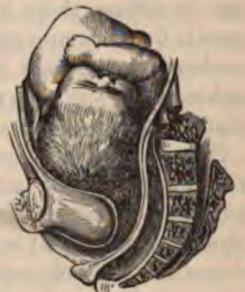
B. *Vulvar or Perineal Hernia.*—We may be allowed to speak in this place of vulvar or perineal hernias, which, although they do not present a mechanical obstacle to parturition, may give rise to special indications during pregnancy and labor. These tumors, which are situated in the lowest and most posterior part of the greater labia, may be formed by the escape of a loop of intestine, and sometimes a portion of the bladder. They have been oftener observed during pregnancy than at any other period, and may ultimately acquire a very considerable size. Papus mentions having dissected one which had the form of a large bottle, hanging to the right of the anus, and descending as far as the leg. In one of the cases observed by Smellie, the tumor, which toward the end of gestation was as large as the fist, became strangulated and gangrenous.

The seat of the tumor, which is always situated in the lower part of the greater labia, between the edge of the anus and the tuberosity of the ischium, the ease with which it is reduced in the horizontal position, and its sudden reappearance when the patient rises or makes the least exertion, serve to indicate its nature. Enterocele may be distinguished from cystocele by the gurgling which accompanies the reduction of the former. The latter often diminishes in size after urinating or using the catheter, and desires to urinate are produced by pressing upon the tumor.

It is evident that the exertions of labor have a tendency to increase the size of the hernia greatly, and even to produce strangulation. It should be kept reduced by pressure properly applied.

c. *Vesical Hernia, or Cystocele.*—It sometimes happens during labor that the fundus of the bladder descends below the head, and constitutes a tumor of variable size at the anterior superior part of the vagina; the descent being probably caused by the pressure made by the child's head or the inferior part of the womb, on the fundus of this organ. The patient has a feeling of weight or fulness in the pelvis, and a dragging sensation about the umbilicus; she has a constant desire to urinate, without the power of emptying her bladder, though, sometimes, each uterine contraction is followed by the emission of a small quantity of urine; besides which, a more or less oval tumor, that is smooth, soft, and fluctuating between the pains, but hard and tense while they last, is detected by the touch at the upper front part of the vagina; and above this the head can often be distinguished; indeed, the finger may easily slip behind the tumor, and reach the cervix uteri; but it cannot pass between the former and the pubic symphysis.

FIG. 111.



Vaginal cystocele, taken from Ramsbotham.

The tumor formed by a cystocele is occasionally quite large. Madame Lachapelle says: "The first thing that attracted our attention was a pediculated tumor, about the size of an egg, which projected a little from the vulva, and seemed to be attached to the right anterior wall of the vagina near its middle. The pedicle was about an inch and a half in thickness, and the tumor contained a liquid, all of which could be pressed back through the pedicle; an opening with a thick margin was then detected, which appeared to communicate with the bladder. In fact, according to the woman's account, the tumor augmented in size in the erect position, though it often disappeared after the emission of urine, and always when using the cold bath. The uterine pains increased the size of the hernia, and the head in descending compressed, and rendered it very tense; after having emptied the bla [illegible] d recommended the students to support it with two fingers during each contraction of the womb. The head soon cleared the passage, sustaining the hernia itself, and the labor terminated favorably."

The tumor is nearly always seated at the anterior part of the vagina; but in a case reported by Sandiford, it was located between this canal and the rectum.

There is one variety of tumor, formed in the pelvic cavity, which is the more worthy of attention, as its true nature might be misunderstood from its singular situation. It depends on a lateral displacement of the bladder, and M. Christian assigns to it the following characters, namely, a remarkable fulness on one side of the pelvis, more especially during the uterine contractions, which give to the tumor an evident elasticity and tension; it is generally circumscribed, though its base is somewhat spread out, and extends along the side of the pelvis as far as the sacrum; its volume varies, of course, with the quantity of fluid contained in the sac, occasionally equalling one-third of the transverse diameter of the pelvis.

The tumefaction completely disappears after the use of the catheter; and, by directing the concavity of the instrument downwards, its point can be felt through the walls, and can readily be moved from before backwards in a horizontal direction. As the tumor is covered by the vagina, and its base is diffuse, there is no danger of mistaking it for the bag of waters, since it does not prevent the finger from reaching the uterine orifice. Cystocele may sometimes be removed by pressure, and almost always by the catheter; its size will vary with the extent of displacement, and with the quantity of urine contained in it.

Cases of this kind merit serious attention, for they may be confounded with other tumors; and such an error of diagnosis might lead to the performance of a useless and perhaps dangerous operation. Dr. Merriman (*Synopsis*, page 202) speaks of a surgeon, who, supposing he had to treat a case of hydrocephalic head, thrust a sharp instrument into the bladder: and a similar mistake, according to Hamilton, was committed by another practitioner, who imagined he was opening the bag of waters.

In all these obscure cases, a resort to the catheter is the best possible means of diagnosis; nevertheless, it must be observed, that, for this measure to be conclusive, it should be done in such a manner as to plunge the beak of the instrument into the liquid contained in the cavity of the tumor; that is, after the instrument has once entered, it should be turned over, so as to make its concavity look downwards and backwards. As a remedy, this is the only one requisite, and the instrument ought to be left in the bladder until after the head is engaged.

Unfortunately, its introduction is not always an easy matter, particularly where the head has been wedged in the pelvis for a long time; under such circumstances, an attempt should be made to press up the former during the intervals; but if this is impracticable, and there is reason to fear a rupture of the bladder from its overdistention, I know of no other resource than to puncture the organ with a very delicate trocar.

§ 6. OF TUMORS DEVELOPED IN THE CELLULAR TISSUE OF THE PELVIS.

We have yet to treat of the fatty, the fibrous, and the cancerous masses, and of the abscesses, or encysted tumors, that may be developed in the cellular tissue of the lesser pelvis, nearly all of which are situated in the substance of the recto-vaginal septum, though they are occasionally found on the sides of the vagina. In one instance, reported by Ed. Meier, the delivery was rendered impossible by the existence of a cyst, about the size of a child's head, between the uterus and the bladder. The steatomatous and cancerous tumors are usually found in contact with the osseous or ligamentous walls of the pelvis, to which they seem to appertain. (See page 676.)

It must be apparent that there is an identity of nature and seat between the tumors of the cellular tissue and those of the ovary; the reducibility of the one, when non-adherent, and the irreducibility of the others, constitute the only marked difference between the two. Consequently, the diagnosis is not easily made out after the engagement of the head, or when the ovarian tumor is retained in place by old adhesions; but, fortunately, that would be an error of little importance, since both present the same indications for treatment. It is more easy to distinguish the tumors of the cellular tissue from those appertaining to the organs before spoken of, and we refer to the signs already given, as characteristic of each of them.

The reader will understand that the prognosis varies according to the size, nature, density, and seat of the tumors. When small, compressible, and situated in the direction of one of the long pelvic diameters, it will most frequently permit a spontaneous termination of the labor; and this may also take place, if, notwithstanding its hardness and size, it still retains a certain degree of mobility. Even in those cases where it is impossible to push it above the superior strait, we may still hope that, being forcibly compressed by the child's head, it will permit the latter to pass. During my sojourn at the Clinique, I saw a woman, in whom the child's head was arrested at the superior strait for a long time, by a tumor, which was probably fibrous in its character, and was situated in front of and on a level with the sacro-iliac symphysis. An application of the forceps had been seriously thought of, but the tumor, located in the recto-vaginal septum, was gradually forced down by the head, under the influence of strong contractions, as far as the floor of the pelvis, where it was pressed backward, at the same time distending the perineum, and the labor terminated by the birth of a living child.

In many cases, the volume and permanence of these tumors do not permit us to anticipate so happy a result, and it will then be necessary to interpose. The indications to be fulfilled will vary according to the particular case; that is, where an abscess or an encysted tumor is detected, it is to be punctured, so as to evacuate the liquid, or it is to be incised when the contents cannot be removed by a simple puncture; but where the tumor is solid, is easily accessible, and has contracted no intimate adhesions with the vagina or rectum, it ought to be extirpated. Two modes of operating have been recommended for this purpose; in the one, the vaginal wall only is incised, while in the other the tumor is reached by making an opening in the perineum. The su[illegible] obtained by Drew and Burns pleads in favor of the latter procedure. In the worst cases, where the situation of the tumor, or the numerous and firm adhesions which it has formed, render its extirpation impracticable, our only resources are in the obstetrical manipulations, properly so called; namely, the application of the forceps, or tractions on the feet, if the tumor is not very large, and the Cæsarean operation, or embryotomy, if the excavation be so obstructed that the extraction of a living child is impossible.

CHAPTER X.

RUPTURE OF THE UTERUS AND OF THE VAGINA.

ARTICLE I.

RUPTURE OF THE UTERUS.

Rupture of the womb is one of the most dangerous accidents that can happen to a female in the puerperal state. Exceedingly rare during the early months of gestation, it is somewhat more frequent in the latter half of pregnancy; but it is during the second stage of the labor, especially, that it most frequently takes place.

Rupture of the uterus has seldom been observed in women bearing their first child. Thus, in seventy-five cases, reported by Churchill, nine occurred in primiparæ, fourteen in women in their second pregnancy, thirteen in their third, and thirty-seven in their fourth or succeeding ones.

The woman's age does not seem to have any marked influence over the production of this accident. Nevertheless, the organic alterations which constitute a predisposition are more unusual in early life than in advanced age.

As the male child is ordinarily somewhat larger than the female, this, according to Dr. Clarke, would be a predisposing circumstance; thus, in twenty cases of rupture, mentioned by Dr. M. Keever, fifteen were male children; and of thirty-four cases by Collins, twenty-three of the children were boys.

The rupture may be seated either in the body or neck of the organ. When it affects the cervix, it is highly important to ascertain whether it only involves the sub-vaginal portion, or whether it invades that part situated above the insertion of the vagina; because the former is attended with very little danger, and occurs very frequently; indeed, it takes place at nearly every labor, just at the instant when the head is clearing the orifice, and it is scarcely ever followed by any unpleasant symptoms. The last, on the contrary, presents the same dangers, and has similar consequences with the ruptures of the body. Therefore, we need only mention here the lacerations that are limited to the orifice, and which do not extend beyond the vaginal insertion; and all that we are about to say concerning the uterine ruptures refers exclusively to those in the body of the womb and in the supra-vaginal portions of the neck. These latter are the more frequent, and they are located somewhat oftener on the posterior than on the anterior face.

§ 1. CAUSES.

Rupture of the uterus always supposes a distention of the organ, and this distention is most frequently dependent on pregnancy. The uterine walls become softened, in consequence of the modifications they undergo; their thickness is a little diminished at certain points, and they become more supple, more elastic, and therefore better calculated to support a slow and gradual pressure; for owing to this suppleness, they can yield without rupturing, though their distention renders them less fitted to sustain a sudden and forcible shock. By this distention, and the increase in volume to which it gives rise, the uterus is forced to ascend above the superior strait; and thenceforth it is no longer protected by the osseous walls of the pelvis, and, consequently, is more exposed to external violence, from which it was shielded during the non-gravid state. Coming, from its situation, in immediate contact with the abdominal parietes without the intervention of any other body, it is subjected to the unequal pressure which the rapid and irregular contraction of the abdominal muscles during any violent efforts may make upon it.

Pregnancy, and the modifications thereby impressed on the uterus, are therefore the essential predispositions to rupture of the uterus; but, independently of these conditions, which exist in all gravid women, there is a number of other circumstances which have a more immediate influence over the production of this accident; and which authors have designated under the titles of the predisposing and the determining causes.

1. *Predisposing Causes.*—Under this head we must include everything that can augment the distention or diminish the resistance of the uterine walls, as, for instance:

A. A great abundance of the amniotic liquid; the presence of several children, &c.

B. The extreme thinness of the uterine walls, which is met with in certain women, and which cannot be accounted for.

[Thinning of the walls of the uterus is most common in women who have had many children, and consequently predisposes them to spontaneous rupture. Turning, in such women, is more dangerous than in primiparæ, because the thin walls of the womb are more readily lacerated.]

C. An enfeeblement of the uterine parietes, dependent on causes which have operated at a more or less remote period, such as falls, blows, &c.; the contused walls inflame, become softened, and ulcerate; sometimes the rupture comes on during the same pregnancy, at others, several gestations may succeed it without any accident, and yet a rupture take place at a subsequent one.

The enfeeblement may likewise result from divers softenings; such as those designated by M. Dezeimeris as the atrophied, the apoplectiform, the inflammatory, and the gangrenous ramollissements, and those produced by organic alterations. We must add another circumstance, which is, in truth, very unusual, but whose influence has been fully demonstrated by several well-attested instances, namely, those women who have undergone the Cæsarean operation, and who have had [illegible] escape the grave dangers that attend it, seem more disposed than others to uterine rupture in the following pregnancy: thus, Dr. Kayser has brought forward six cases in his excellent thesis, in which the patients, who had before been operated upon safely, have been compelled to submit to gastrotomy, in consequence of a rupture of the womb; three of these women died.

D. All the organic alterations, and all the degenerations of tissue of which the uterus may be the seat, such as the scirrhous, fibrous, or encephaloid tumors. The softening and ulceration of these morbid masses may render that portion of the walls they occupy thinner and weaker; oftener, on the contrary, they augment the thickness and even the consistence of the uterine tissue, but still act as predisposing causes of ruptures, at least during parturition, in the following way: the point thus affected not contracting, whilst all the others are in action, the resistance made by it would be wholly passive; and hence, whatever be its strength, it cannot hold out against the contractions of all the rest of the organ, the action of which, being aided by that of the abdominal walls, weighs with all its force, as it were, on that portion which does not participate in the general action; and if we suppose that any obstacle whatever prevents the ready engagement of the fœtus, the uterine effort, which is incapable of overcoming the resistance it encounters in clearing the superior strait, is felt at the point which does not contract, and consequently this latter becomes ruptured. And it is by a similar mechanism that the irregular or partial contractions may produce a rupture, by leaving some one point of the uterine walls in a state of inertia, whilst all the others are contracting.

During the labor, we must add everything that may render the parturition difficult, or require unusual and long-repeated contractions on the part of the organ. In this respect, all narrowing of the pelvis, every tumor that obstructs the excavation, all resistances offered by the cervix uteri, whether dependent on an agglutination of the lips, a degeneration of its tissue, or a state of spasm, or a considerable obliquity of the body, and the malpositions, as well as the malformations of the fœtus, may become causes of rupture of the uterus.

The ruptures of the uterus which take place during labor almost always occur after the rupture of the membranes. Still, James Hamilton reports a case in which the *membranes were found entire* at the autopsy.

2. *Determining Causes.*—A number of causes may serve to produce a rupture under the influence of some one of these predispositions; all of which, however, can be classified under two principal heads, namely, the external or traumatic, and the internal causes.

3. *External or Traumatic Causes.*—It is not without some hesitation that I venture to say a few words here about the traumatic lesions to which the womb is exposed as a cause of rupture; for it is well known that, at every period of life, this organ is liable to be injured by a projectile thrown by gunpowder, by any murderous instrument, or by the horn of an infuriated animal. But it must be remembered that the increased size of the organ, during gestation, exposes it then more than ever to this variety of lesions; though the consequences and the indications for treatment are, in other respects, nearly the same. Again, we must add that perforations and lace tions of the uterus often result from ill-directed obstetrical manipulations

The womb is also greatly exposed to compression or violent contusion of its walls, when it is developed by the product of conception. This compression may be mediate, that is to say, dependent on exterior causes, such as falls or blows on the abdomen, the pressure of this region by the backing up of a coach against a wall, or the passage of its wheels over the belly; or it may be immediate, that is, due to the violent contraction of the abdominal muscles. The effects of mediate compression are generally of little consequence, owing to the mobility of the uterus, the suppleness of its walls, and the *point d'appui* which the latter find in the surrounding parts. Nevertheless, they sometimes are followed by diastrous consequences: thus it is stated, in the old *Journal de Médecine*, that a woman had a rupture of the womb at the seventh month of her gestation, in consequence of having been pressed between a wall and a carriage. As before stated, the contusion of the ventral parietes seldom produces an immediate rupture; but the bruise and consecutive inflammation of the uterine structure may determine an ulceration, and then a perforation at some future period.

The ruptures by immediate compression, or those which result from the violent contraction of the abdominal muscles, seldom occur without the preexistence of some one of the alterations of the uterine walls, considered above as predisposing causes. They generally follow a fit of coughing, sneezing, or vomiting, or take place during a paroxysm of anger; but they may likewise be occasioned by the patient's attempts to raise some burden, and by the forcible bending of the body backward, which latter cannot occur without the recti muscles of the abdomen becoming closely approximated to the vertebral column during the forward curvature of the trunk; in all these movements the womb is forcibly compressed between the abdominal muscles, which contract vigorously, and the posterior plane of the abdominal cavity. A rupture has been known to occur at all stages of gestation, from the earliest months up to full term, under the influence of some one of these causes.

4. *Internal Causes.*—Authors have incorrectly considered the enormous distention of the uterus during pregnancy as being capable of producing a rupture; for, although this distention is a predisposing cause, yet however great it may be, it cannot of itself give rise to such an accident without the previous existence of an organic alteration. The same is true of the violent and convulsive movements of the fœtus, whose impetus is too inconsiderable to occasion a rupture; and besides, the womb is fully protected against its influence by the amniotic liquid and the suppleness of the walls.

During labor, the uterine contraction is the most frequent determining cause; and though the walls of the organ were altogether passive in the course of gestation, they here play the principal part in the production of the rupture.

After the membranes are ruptured and the waters entirely discharged, the walls of the uterus are applied directly upon the fœtal ovoid. Now, in the doubled-up condition of the various parts of the child, numerous projections and irregularities are presented, which make the resistance at its different points very unequal. Consequently, some parts of the uterus are more or less stretched over the [illegible]se Madame Lachapelle's expression, some of t[illegible] wrong direction, whilst others, finding a fir[illegible]rgy.

The equilibrium of the forces is then, says M. Taurin, broken at several points of the womb, and the organ contracts irregularly. The non-compressed, healthy, and thicker parts contract with greater power, and draw upon the parts in the vicinity; the latter, already distended by the fœtal projections, become still thinner, their resistance yields more and more, and at last, incapable of longer resistance, they give way under the more powerful contractions of the neighboring parts.

Such would be the course of affairs, more especially in an unfavorable position of the fœtus,—one of the shoulder, for example.

We would add further, that when the labor is prolonged greatly, the pressure of the fœtal projections upon the walls of the uterus may cause their inflammation, ulceration, or even gangrene, all of them circumstances likely to facilitate rupture.

Deformities of the pelvis, by presenting a mechanical obstacle to the passage of the fœtus, also constitute a predisposition to rupture; but even here, the contraction is the determining cause. In some other cases, the hard and unequal projections presented by the irregularly contracted circumference of the pelvis may produce a direct rupture of the lower segment of the uterus, or of the walls of the cervix. Thus, we may readily conceive that a too great anterior projection of the sacro-vertebral angle, as also the prominent ridge sometimes presented by the superior and posterior face of the symphysis pubis, might bruise, or even tear, the part of the uterus which is strongly compressed between it and the head of the fœtus. M. Taurin mentions a case in his thesis in which M. P. Dubois attributed to this compression a rupture comprising a part of the vagina, the whole anterior surface of the neck, and which extended up the left side of the body of the uterus.

The child's active movements are as foreign to the laceration that takes place in parturition as to those that occur during pregnancy. For, according to the observations of M. Duparcque, if this movement is effected during the relaxation of the walls, their suppleness and extensibility enable them to yield to this force; but if, on the contrary, it takes place while the contraction lasts, the resistance which they then present would require a far greater impetus to overcome it than any that can result from even a convulsive movement of the fœtus. The contraction is therefore the sole determining cause; but, for it to produce a rupture, its action must be favored by one of the predisposing circumstances before indicated, the influence of which is easily understood.

These spontaneous ruptures hardly ever take place except in labors at term, and appear impossible in abortions at four or five months. A case which removes the smallest doubt as to the possibility of such an accident within the first six months of gestation, has, however, been communicated to M. Danyau by M. Castelneau. A woman died almost suddenly in consequence of a profuse hemorrhage, and it was found that the neck of the uterus and the vagina were ruptured, the former through its entire length and the latter at its upper part. The accident occurred, in all probability, during contractions which expelled the ovum very rapidly; for although no portion of it remained in the uterus, the organ presented every appearance of one which had attained the usual development at five months of gestation.

However, it must not be forgotten that rupture of the womb has often occurred during parturition, from the imprudent manipulations made with a view of terminating the labor. For how often has an application of the forceps, a resort to version, or a difficult extraction of the placenta performed by inexperienced hands,—how often have all of them been followed by the early death of the patient, and a laceration of the organ been detected at the autopsical examination! In fact, cases of this kind are mentioned by nearly all authors; and Madame Legrand, the midwife-in-chief of La Maternité, informed me that several women are brought to the hospital every year to die, the victims of such attempts made in the city. I have seen a uterus, the lower two-thirds of whose body on the right side had been torn away by the embryotomy forceps; and, in another case, I found at the *post-mortem* examination a perforation in the right superior part of the body of the womb, produced by the attempts which a practitioner had made to separate a firmly adherent placenta. Facts of this nature cannot be repeated too often, for they are calculated to render young physicians, who intend to practise midwifery, more cautious; and to convince them that, to have attended two or three women in labor is not all that is needed to render them capable of performing the most difficult operations of our art.

[I repeat, therefore, that spontaneous rupture of the uterus is an event of rare occurrence, whilst lacerations produced by the manipulations required in turning, or the introduction of an instrument, are comparatively common. I have met with but a single case of spontaneous rupture, but, unfortunately, have seen quite a number of traumatic lacerations resulting from badly performed operations. The most skilful operator, without any fault of his own, may be the involuntary cause of rupture and cannot be justly censured; yet it is nevertheless true, that almost all such occurrences are the immediate consequence of want of skill or the use of too great force in the introduction of the hand or an instrument.]

§ 2. SYMPTOMS.

The signs of rupture of the uterus are easily made out; for most frequently the laceration takes place suddenly after some violent effort that has necessitated a forcible contraction of the abdominal muscles. It is manifested by an exceedingly sharp pain just at the point where the accident occurred, which makes the patient scream out from the intensity of suffering. This acute, or, as Desormeaux describes it, agonizing and cramp-like[1] pain, is accompanied by a sound of tearing or cracking, loud enough, in some cases, to be heard by the surrounding persons. This pain soon changes to a sensation of numbness, and is followed almost immediately by swooning; the patient becomes pale, her pulse sinks, and she falls into a state of syncope. These primary phenomena are the only ones that are manifested when the pregnancy is not far advanced, and when the uterus has not ascended high enough to be easily accessible; or, else, when the ovum, having engaged in the lips of the wound, plugs it up in such a way as to prevent any effusion into the abdominal cavity. A deceitful calm may thus succeed the storm, and the symptoms be only renewed after several hours, or even days, when the uterus, by contracting, shall expel the parts it incloses into the abdominal cavity. In the opposite cases, and more especially in the advanced stages of gestation, we can readily detect the softening and depression of the hypogastric walls by an examination of the patient; for, instead of feeling the hard, globular tumor formed by the womb in this region, we simply find the yielding, depressible walls of the abdomen, and still lower the more or less reduced and distorted neck of the uterus. The patient who, at the instant of rupture, or shortly after, experienced a gentle heat diffusing itself through the abdomen, now feels some strange movements, or an unusual weight at a point where she never had them before; and the accoucheur himself detects the presence of the child in a spot where it should not be, and he can now distinguish its movements and the prominences it offers much more clearly than usual. But these active motions of the fœtus soon cease to be apparent, though their final disappearance is ordinarily preceded by an unusual and almost convulsive agitation; most generally, a little blood escapes from the vulva, in consequence of the detachment of the placenta, but this phenomenon may be wanting, especially in first pregnancies. Where the accident occurs during labor, the pains, that were hitherto strong and energetic, disappear at once.

---

[1] According to Dr. Roberton, when a rupture takes place in consequence of a contraction of the pelvis, it is preceded by crampy pains and a sensibility to pressure at a circumscribed point of the hypogastrium. This crampy pain is caused by a compression of the uterus between the child's head and the promontory of the sacrum, or some other prominent osseous part. A pain of this nature existed in a high degree in a woman, in whom the anterior lip of the cervix uteri was considerably tumefied, and was also situated much lower than the head; Dr. Roberton succeeded in relieving it, by pushing up the tumefied lip during the interval between the contractions.

The most conclusive signs are furnished by the touch; thus, during gestation, the finger can detect a change in the position of the womb, and the want of the volume which it generally has at the stage of pregnancy the woman supposes herself to have arrived at. Sometimes it can even feel a part of the fœtus situated externally to the womb, and depressing the upper part of the vagina. During the labor it finds the bag of waters to become suddenly collapsed, or no longer projecting through the os uteri, and yet without the escape of any liquid by the vagina. The presenting part of the child, which, a few moments before, was accessible to the finger, has now gone up, and perhaps disappeared altogether; the cervix uteri has shrunk up, and the orifice is much less dilated than it was previously

If an attempt be then made to pass the hand into the uterine cavity, perhaps it will find this cavity wholly obliterated by the retraction of the walls; or possibly it may encounter the intestines there, or else only a part of the fœtus, the rest having escaped into the belly. The seat and extent of the laceration can thus be determined, and, in some instances, the hand may even be made to penetrate through into the abdomen.

When all these phenomena are met with, there can be no doubt in regard to the nature of the accident, but it is not always possible to recognize them so clearly; for if the child, instead of being displaced, remains in the cavity of the womb after the rupture, it may happen that the signs furnished by the vaginal touch, and the abdominal palpation, will be altogether wanting. In this case, the diagnosis is very difficult, and the cause of death is disclosed only by the autopsy.

[Experience, or, if the expression be preferred, personal acquaintance with the accident, may enable one to suspect the occurrence of laceration in many of the cases. Suppose an accoucheur to be called to a case in which turning, or an application of the forceps or cephalotribe, has been attemped; his first thought will be to ascertain the fact that no rupture has been produced by the manipulations. He will, therefore, learn the number and nature of the manœuvres employed before his arrival, and then proceed to examine the patient. When rupture has occurred, the woman is almost always in a state of great prostration, pale and with altered features. The breathing is accelerated and the pulse very quick. Pressure on the abdomen produces severe pain on one of the sides of the uterus, being that which corresponds to the rupture. Touching causes the discharge of a little blood, the appearance of which has, in our view, a certain importance; for we have thought that, in such cases, it was brownish or syrupy in appearance. When rupture takes place, the presenting part of the fœtus often ascends and becomes movable; elevation and mobility of the presenting part ought, therefore, to be well considered, especially when they occur at an advanced stage of the labor. This explains why turning, so difficult in some cases on account of contraction of the uterus, becomes suddenly very easy after a rupture. Whilst practising the touch, if the finger be carried very high, the laceration may sometimes be reached and the intestines felt through it. This removes all doubt in the matter; but it is often impossible to reach the seat of the rupture, and then the accoucheur must be guided by the signs mentioned above in forming his diagnosis, which he will verify after delivery by introducing his hand into the uterus.]

§ 3. Prognosis and Termination.

The prognosis of uterine ruptures is exceedingly unfavorable; for they nearly always prove fatal to the child, and expose the mother to an almost certain death. Nevertheless, its gravity varies according to the extent and the seat of the lesion, and the consecutive phenomena to which this gives rise.

Some cases have been reported in which the great disorder in the organism produced by the rupture, and the escape of the blood, waters, and fœtus into the abdominal cavity, caused instantaneous death. But, most generally, some particular phenomena, or symptoms, occasioned by the accidents consecutive to the primary lesion, precede the fatal termination; which latter may result either from hemorrhage, from the inflammations and suppurations created by the prolonged sojourn of a foreign body in the peritoneal cavity, or from the operations necessary for its extraction.

A. *Hemorrhage.*—Flooding is the most frequent, and at the same time the most speedily fatal, of all these accidents. Its source is evidently in the torn vessels of the womb, especially when the rupture takes place at the point of the insertion of the placenta; but when this point remains intact, it principally comes from the utero-placental vessels which have been torn by the detachment of the after-birth; since the margins of the rupture, when this occurs at some distance from the placenta, usually furnish but little blood. As a general rule, only a small quantity of it reaches the exterior; while, on the contrary, it is effused abundantly into the belly along with the amniotic waters and the body of the child (which has passed in a great measure into the peritoneal cavity), and the whole distends the abdomen enormously. Again, this effusion is equally profuse in those cases in which the waters have escaped, and the infant lies in the womb in such a way as to prevent its issue. The ruptured margins being hindered from coming together, the lacerated vessels continue to pour out their blood, until the hypogastric walls oppose a resistance to the effusion, which is always too late to prevent death; and the latter may thus take place without being preceded by any sign that would lead us to suspect the rupture. Again, it may happen, even when the delivery is effected immediately, that the contraction is not sufficiently energetic to obliterate the calibre of the vessels entirely, and the hemorrhage continues long enough to destroy the patient.

The effusion ordinarily takes place into the sac of the peritoneum; but when this serous tunic is not implicated in the solution of continuity, the blood infiltrates between it and the uterus, gains the duplicature of the broad ligaments, and may thus get into the cellular tissue of the pelvis and loins. In such cases, a layer of black blood is found interposed between the peritoneum and the womb, where, by becoming exactly modelled on the external surface of the organ, it assumes its form, and may thus by its livid color be mistaken for a gangrenous state of this viscus. (Duparcque.)

Nevertheless, the uterus may be ruptured, without being necessarily followed by a profuse hemorrhage; as where the laceration takes place at a point which is moderately provided with vessels, in the vicinity of the neck, for example. On the other hand, it may happen that, the ovum remaining intact after the accident, the fissure becomes filled up in a measure, either by a portion of the membranes or placenta, or a part of the child; or the body of the infant may be partly driven into the abdomen, whilst the borders of the laceration become so retracted around it that the salutary compression thereby produced prevents a continuation of the hemorrhage. Again, when the entire ovum passes rapidly through the fissure into the peritoneal cavity, the uterus prevents or at least diminishes the bleeding by contracting at once, whereby a powerful obstacle to the further discharge of blood is created.

B. *Inflammation.*—When the patient does not die from the loss of blood that immediately follows the rupture, a momentary calm succeeds, but the presence of foreign bodies in the cavity of the peritoneum gives rise to an inflammation of this membrane, which is the more serious as they are the larger; and even where the accoucheur has succeeded, by any mode whatever, in removing the fœtus and after-birth, inflammation, though less to be dreaded, may still result from the operation or measures necessary for this extraction, and may speedily terminate in death.

C. *Escape of an Intestine through, and its Strangulation in, the Fissure.*—A considerable portion of intestine has been known to pass through the laceration in the uterus, and to become strangulated by the retraction of the organ. This accident, which would not be suspected, if the fœtus were still inclosed in the womb, or if the latter had completely retracted, might, however, be detected immediately after the delivery; but should it escape detection, it would infallibly terminate in death, as occurred in the case reported by Percy, and reproduced by M. Deneux. Consequently, whenever there is reason to suspect a rupture of the womb, it is necessary to carry the hand up into the interior of the organ as soon as the delivery is effected, and (following the plan of Rungius) to press back the intestines into the abdomen, and then keep the hand in the uterine cavity until the organ is sufficiently retracted, and the fissure diminished, to prevent a return of the hernia.

D. *Recovery.*—Some women have recovered from all these dangers; a few have even undergone gastrotomy, and survived the consecutive accidents; while in others, the fœtus and its appendages have escaped bodily into the peritoneal cavity, and have there given rise to inflammatory symptoms which gradually passed off. Salutary adhesions were formed, as a consequence of the inflammation, whereby the fœtus and its appendages were inclosed in a pseudo-membranous cyst that isolated them from the surrounding parts; the latter became habituated to this new vicinage, which has continued for a variable period, and sometimes even throughout life. But this cyst, like those which surround other extra-uterine products, may become the seat of a fresh inflammatory action; its walls contract new adhesions with neighboring organs, and we sometimes find ulcerations and perforations occurring, after the lapse of many years, by which the cavity of the cyst is made to communicate with that of the intestine or bladder, and the last pieces of the skeleton are finally expelled through the urethra, the rectum, or the vagina.[1]

Where the child remains in the uterine cavity, notwithstanding the rupture, and the contractions do not immediately expel it by the natural passages, the same phenomena may be subsequently manifested; that is, the inflamed and ulcerated uterine tissue contracts adhesions either with the abdominal parietes or with those of some adjacent organ, and the fœtal debris then escape through the ulcerated and perforated wall, or else by the natural openings of the excretory organs. (Duparcque.)

§ 4. PATHOLOGICAL ANATOMY.

Every portion of the uterus may become the seat of rupture, though there are some parts which are more liable to be affected than others; such are the inferior regions, the fundus, and the lateral portions of the body, and the superior or supra-vaginal parts of the neck. Moreover, the seat of laceration varies according to the cause that has given rise to it, as also to the period at which it takes place; thus, during gestation, the body is always ruptured, but during labor, on the contrary, these solutions of continuity are met with about the neck or inferior portion of the body, which is, in general, thinner, and not so well supported as the rest of the organ. Where the accident has resulted from some external compression, the walls usually become lacerated towards the lateral parts; when it has resulted in consequence of a contusion, the bruised point is ordinarily the one that afterwards gives way: and if the rupture has been preceded by any organic alteration, the laceration takes place at the diseased point. It may happen, says M. Dubois, that the part of the uterus affected with chronic disease, instead of being weaker, is really stronger and more resisting than the healthy parts alongside, which are the ones to give way. (Taurin, *Thèse.*) The front and back walls, being protected by the anterior and posterior planes of the abdomen, would seem to be perfectly sheltered from such accidents; this, however, is not always the case, for instances have been reported which prove the possibility of ruptures of this kind. According to Dr. Roberton, when the laceration is caused by a narrowness of the pelvis, it may occupy any portion of the womb, though more frequently, perhaps, it involves its posterior inferior part; which is explained, in his opinion, by the pressure that the sacro-lumbar prominence makes on this region. Sometimes, also, it takes place in the anterior inferior part, and is then due to the osseous projections located on the internal face of the pubic symphysis. The anterior superior wall is oftener injured by foreign bodies; indeed, it is the almost exclusive seat of ruptures produced by wounds.

---

[1] For instances of recovery, see: Peu, *Pratique des Accouchements*, 341; Hamilton's *Outlines of Midwifery;* James Hamilton, *Select Cases in Midwifery*, 138; Jos. Clarke, *Trans. of Association*, vol. i.; Douglas, *Essays on Ruptures of the Uterus*, p. 7; Labatt, *Dublin Med. Essays*, p. 343; Frizell, *Trans. of Association*, vol. ii. p. 15; Roos, *Annals of Med.*, vol. iii. p. 377; Kite, *Mem. of Med. Society*, vol. iv. p. 253; Powel, *Med. Chir. Transact.*, vol. xii. p. 537; Birch, *Ibid.*, xiii. p. 537; Smith, *Ibid.*, p. 378; MacIntyre et Brook, *Med. Gazette*, vol. vii. et Janvier, 1829; Hendrie, *Amer. Jour. of Med. Science*, vol. vi. p. 351; Davis, *Obst. Med.*, vol. ii. p. 1070.

MM. Keevar and Collins have each reported two cases; M. Duparcque quotes four from French authors. Osiander states that he has met with several cases of the kind. and M. Velpeau mentions several others.

Nothing can be more uncertain than the extent, form, and direction of the uterine ruptures; since they vary in size, from a little hole that is scarcely capable of admitting the end of the finger, up to a large fissure extending over two-thirds of the fundus, or periphery of the neck, or, indeed, occupying nearly the whole organ. It may have a longitudinal, a transverse, or an oblique direction, or it may affect a circular form, as often happens about the neck; or it may run in a straight line, or in a zigzag course. The divided margins are rarely observed to present a clear and regular section; but, instead, they are most usually found unequal, haggled as it were, contused, and ecchymosed to a more or less considerable extent. If the rupture has resulted from some organic alteration, the anatomical traces of the previous disease are found at the affected point. Lastly, if the patient has not died till several days after the accident, the autopsical examination will verify the presence of the matters effused into the peritoneum, and the unequivocal marks of a violent inflammation of this serous membrane; besides which, the borders of the uterine fissure will sometimes be red, livid, and inflamed, and occasionally even gangrenous.

The lacerations of the womb do not always implicate the whole thickness of the organ, for the tunics, that enter into the composition of its walls, do not all possess the same degree of elasticity; and hence it is possible for them to be ruptured separately. Madame Lachapelle says, a fissure of the orifice propagated to the neck, and even to the body of the organ, has very often divided the whole muscular layer, leaving the serous membrane intact. I have particularly observed, she continues, fissures of this kind on the sides of the womb which were covered by the duplicature of the broad ligament, whereby the wound was prevented from extending into the abdomen. M. Duparcque furnishes a very similar case; and Dr. Collins reports nine others in which the peritoneum was not injured, though the muscular layer of the neck was lacerated to a considerable extent. I have likewise had an opportunity of observing an identical instance in the practice of Professor Velpeau, in which I was enabled to verify the truth of the remark made by M. Cruveilhier; namely, that the laxity in the adhesion of the peritoneum to the cervix, and to the sides of the uterus, fully explains why this membrane is so rarely involved in those cases in which a considerable rent has occurred in the neck, and why the effusion of blood then takes place between the uterine tissue and the peritoneal serous membrane. Cases have occurred in which the blood collected in very large amount, and even the fœtus itself, completely expelled from the uterine cavity, has been found in the species of sac formed by the detached serous membrane.

In some more rare cases, the muscular structure resists, and the peritoneal layer alone gives way. Where this occurs, the disease can scarcely be recognized during life, for the phenomena that precede death are either those of a hemorrhage, or of a violent peritonitis; but a large quantity of blood is ordinarily detected at the *post-mortem* examination, and, by searching for its source, one or more fissures of a variable extent are found in the uterine serous membrane. To the case of this kind reported by Ramsbotham, we can now add several others that have recently been published; one of the most curious of which is that furnished by H. Partridge (*Arch. de Méd.*, t. 19), where a great number of lacerations running transversely, were found at the *post-mortem* examination; these were more or less curved, and were variable in depth, and they extended from half an inch to two inches in length. A shred of peritoneum had been completely detached and hung within the abdomen, thus laying bare the naked fleshy tissue from which it had been torn.

§ 5. TREATMENT.

The measures that have been proposed for the treatment of ruptures of the womb, may be designated as the prophylactic and the curative. The object of the former is to avert the influence of the causes that have been described as predisposing to this accident; and we refer for an account of those whose existence it is possible to foresee, such as the divers obstacles to delivery, to the chapters on Dystocia; and with regard to the others, as it is usually impossible even to suspect their presence, we shall pass them over altogether.

A rupture of the uterus is only serious from the disastrous consequences which follow it; therefore, the prophylactic measures must be directed, not against the rupture itself, but rather against the consecutive accidents to which it gives rise. The best mode of preventing them is to facilitate the retraction of the organ by immediately extracting the fœtus and its appendages; for it has been shown that it is the hemorrhage, and the inflammatory symptoms which follow the child's displacement and subsequent sojourn in the cavity of the abdomen, that are to be particularly dreaded.

Perhaps the indications for treatment presented under such circumstances will be best illustrated by supposing the rupture to take place at three different periods of the puerperal state, namely. during the parturition; during the latter months of gestation; and during the early stages of pregnancy.

1. *During the Labor.*—In this case the infant may either remain within the womb, or it may have been driven out of the uterine cavity.

A. If the child remains *in situ*, its extraction, either by the pelvic version or by the forceps, is of course the only admissible operation. When the forceps are used, it is very important, as M. Dubois remarks, that the child should be fixed in its position by the hand of an assistant applied to the walls of the abdomen, in order to prevent its ascending into the peritoneal cavity through the fissure. The introduction of the blades also demands especial care when the neck is ruptured transversely, in order to avoid passing them into the abdomen through the rupture. But where any obstacle appertaining to the pelvis or the soft parts opposes its delivery by the natural passages, gastrotomy ought certainly to be performed if the infant is living and viable, and craniotomy when it is dead, or when it has suffered severely from the slowness of the labor.

B. If one part of the child has passed into the abdominal cavity through the fissure, while the other portion of it is still inclosed within the uterus, we must endeavor to deliver it through the natural passages, by acting on the portion retained in the womb, or which has already engaged in the os uteri or vagina. But if the presenting part is high up, and the hand or instruments cannot get a sufficient hold upon it, it will be necessary to search through the fissure after the feet, and bring them down into the vagina. But here another difficulty arises, for the escape of the waters and a part of the fœtus may have determined a contraction of the womb, and the lacerated margins, participating in this retraction, may be found so closely applied to the child's body as to render a passage of the hand impossible; under such circumstances, we might follow the example of certain accoucheurs, and open a passage by enlarging the wound in the uterus with a cutting instrument, which would be far preferable to the performance of the Cæsarean operation.

C. Supposing the child has passed into the abdominal cavity, and that the organ has not as yet retracted, that the os uteri is sufficiently dilated or dilatable, and the uterine fissure is still large enough to permit the hand and fœtus to pass through, which conditions are scarcely ever met with when the rupture occurs at the cervix, we ought, as in the preceding case, to go after the feet even into the cavity of the abdomen, and bring them back through the lips of the wound, the neck of the uterus, and the vagina, and thus extract the fœtus by the natural passages. After this delivery, the hand should again be introduced into the uterine cavity, with the threefold object of extracting the after-birth, of determining the contraction of the organ, and of preventing the strangulation of a loop of intestine, if any portion of the bowel had engaged in the fissure.

Should the placenta have happened to fall into the peritoneal cavity, an effort should be made to extract it without delay, by a fresh introduction of the hand through the rupture. An attempt should be made at the same time to remove the clots which had formed in the abdomen.

When such a manœuvre is impossible, the only resource is in the Cæsarean operation; unless, being fearful of the disastrous consequences of this operation, the accoucheur should conclude to abandon the fœtus in the peritoneal cavity, and allow the mother to run all the dangers to which this determination must necessarily expose her. If the child's death were positively ascertained, the arrest of the hemorrhage might *perhaps* authorize this latter procedure, more especially if he should not see the patient until several hours after the accident; but it would never be excusable if the infant were living, and if he were not satisfied that the uterus, by being completely retracted, had obliterated the vessels which furnished the blood; for otherwise, gastrotomy should be resorted to at once.

2. *During the Latter Months of Gestation.*—Here, likewise, the extraction of the ovum is the wisest course to pursue; indeed, it is imperiously indicated when the child is living, and the pregnancy has advanced beyond the seventh month; and it may be accomplished by resorting either to gastrotomy, to a forced dilatation of the os uteri, or to incisions made directly on the neck of the womb. The Cæsarean operation will be preferred whenever the fœtus is displaced (see *Cæsarean Operation*); but if it is still resident in the uterine cavity, we must endeavor to dilate the os uteri artificially, which will generally be feasible when the patient is near term, more especially if she has previously borne several children; and the introduction of the hand might likewise be facilitated by incising the periphery of the cervix. But these attempts ought to be made with the greatest care, and should they offer any serious difficulties, and require too much time, we must renounce them at once, and open a passage through the abdominal wall.

3. *During the Early Months of Gestation.*—Most of our leading teachers advise us to abandon the patient in these cases to the resources of nature, to abstain from all operations, and to be content with combating the consecutive symptoms as they arise. Three new indications are now presented, says M. Duparcque, namely: 1. To prevent or arrest the disorders of innervation, by raising the *morale* of the woman, who is instinctively struck with fears and inquietudes, and by administering the diffusible antispasmodics by the mouth, the skin, or the respiratory passages; 2. To combat or prevent the hemorrhage by abdominal compression, by refrigerants, compression of the aorta, &c.; and, 3. To prevent or combat the inflammation which ordinarily follows the displacements of the ovum, by the employment of local and general antiphlogistics.

ARTICLE II.

RUPTURE OF THE VAGINA.

The walls of the vagina may also be lacerated during the labor. But, owing to the differences that exist, according to the portion of the canal these ruptures may occupy, it has been customary to study separately the lacerations at its upper and lower extremities, and at its middle part. In general, the two latter are of little consequence, or, at least, the dangers and indications they present belong rather to the province of the surgeon than to that of the accoucheur; for, with the exception of thrombus of the vulva, which may, as has been stated, require the intervention of art during labor, all the other lacerations are only unfavorable to the woman, inasmuch as they expose her to vesical or recto-vaginal fistulas, which do not claim our attention here. On the contrary, the lacerations that occupy the superior extremity of the vulvo-uterine canal require a cursory notice, because they, like the ruptures of the lower part of the uterus, may become causes of dystocia. The lacerations of the upper part of the vagina may result either from traction or from direct pressure. The former may be owing to the uterine contraction, to the artificial pressing back of the uterus or presenting part of the child, and to every act of the abdominal walls, and every movement of the trunk, calculated to elevate the womb. According to M. Duparcque, the uterine contraction alone may produce a transverse laceration of the vagina in the following manner: the child's head being wedged in at the superior strait, or more or less engaged in the excavation, and unable to advance any further in consequence of the resistance it encounters, and the womb still continuing to contract, the latter withdraws itself, as it were, from the child. The margins of the orifice are gradually drawn up towards the fundus of the organ, whereby they get clear of the head in a great measure, and sometimes altogether. Whence it happens that the vagina becomes subjected to an active traction, proportioned to the energy of the uterine pains; and consequently, as it offers only a passive resistance to the distention and compression it undergoes, it is gradually enfeebled, and ultimately gives way.

The mode in which the efforts sometimes made during version for the purpose of pressing up the presenting part, or for penetrating through the os uteri by main force, so as to carry the hand towards the fundus of the organ, act in the production of these lacerations, is easily understood. And this transverse rupture, having once commenced, may extend far enough to separate the uterus almost entirely from the vagina. Those fissures and vaginal perforations which result from direct pressure, are ordinarily produced by an improper application of the forceps, or by the prolonged sojourn of the head at the superior part of the excavation.

The signs of this rupture, and the accidents to which it gives rise, are very similar to those of rupture of the uterus, excepting that they are less intense and not so dangerous. The pain is less acute at the time of its occurrence, being sometimes even confounded with the labor-pain; and the existence of a laceration is only suspected, some time after, when searching for the cause of the arrest of the labor. Here, likewise, the child may either preserve the place it occupied, or may pass partially or wholly into the abdomen. Most generally there is no displacement when the head had previously engaged in the excavation, and the rupture has taken place either at the junction of the vagina with the cervix or else at some point above the head. Nevertheless, should the laceration be very extensive, the head may remain fixed in the excavation, while the trunk is carried back into the abdominal cavity by the subsequent retreat of the womb, the orifice of which, being no longer retained by the vaginal connections, mounts up and retracts towards the fundus of the organ, thus abandoning the fœtus which it cannot expel. It seldom happens that the whole child escapes into the abdomen, and, when this does occur, it always results from pushing up the head during the ill-directed efforts to effect the delivery. But, whether this passage is partial or complete, it ordinarily takes place in such a way that the pelvic extremity engages first in the lacerated orifice.

A considerable portion of intestine has sometimes been known to escape through a rupture of the vagina; it is evident that in such cases reduction should be effected as soon as possible. Although it would seem that this operation ought not to be attended with difficulty, it has occasionally proved impossible. Burns quotes from Dr. Kerver a case of rupture of the vagina complicated with the escape of a portion of intestine an ell long. It was impossible to reduce it, and gangrene ensued. The fæces passed by the vagina; but, after some time, were discharged by the anus, and the patient recovered.

The prognosis is much less unfavorable than that of uterine ruptures; because there is far less danger from the hemorrhage and consecutive inflammations, and, besides, it is always possible to extract the fœtus by the natural passages.

This extraction through the vagina is, therefore, the only indication which presents itself. If the head is not displaced, apply the forceps; but if some other part presents, the feet should be sought after through the rupture in the vagina, which it may be necessary to enlarge if too small or too resisting. The Cæsarean operation must not be performed, even should the fœtus have passed completely into the abdominal cavity, unless a contracted pelvis should render it impossible to extract it through the natural passages.

CHAPTER XI.

OF PUERPERAL HEMORRHAGE.

HEMORRHAGE is certainly one of the most frequent and at the same time most dangerous accidents that can occur to puerperal women, whether before, during, or after parturition; for it is most generally fatal to the child when it occurs at an early period of the pregnancy, and always subjects the mother to the greatest dangers, at whatever period it may come on. Under the double aspect, therefore, of the mother's safety, and the child's life, it constitutes a pathological phenomenon, which should interest every one in the highest degree; not only every physician who devotes himself more especially to the practice of midwifery, but likewise all who are engaged in the practice of medicine; for any one may be summoned in a time of pressing danger, and all may, by ill-directed or proper attentions, compromise or save the lives of two beings equally dear. The importance of the subject, therefore, will justify the detail into which we propose entering.

We designate as *puerperal hemorrhage* (or the hemorrhage that occurs in the puerperal state) every hemorrhagic accident that pregnant women may be affected with, either during gestation or in the course of the labor and lying-in; thus comprising, under this denomination, not only the losses of blood that have their source and seat in the genital organs, or in the fœtus and its appendages, but also all the effusions that may take place into the tissue of the principal viscera as a consequence of an *exaggeration* of the modifications impressed on the general circulation by pregnancy. We have already treated of hemorrhage occasioned by the rupture of a varicose vein, (see page 487,) also of that which accompanies abortion, (see *Abortion.*) We have also devoted a long article to hemorrhages of the vulva and vagina, (see *Thrombus of the Vulva and Vagina*, page 686.) Hemorrhage attendant upon delivery of the placenta, will be studied in connection with the other difficulties which complicate its expulsion. (See the last chapter on *Dystocia.*) Here we shall devote more particular attention to the discharges which occur during the last three months of pregnancy, or during labor, and which have their source in the vessels of the uterus, or fœtus, or its appendages. As to the other hemorrhages, whatever be their origin, or the seat of effusion, they present the same indications for treatment in the puerperal state as at any other period of life, and consequently do not claim our attention here. For, during the labor, whether the hemorrhage takes place in the lungs, the stomach, or the brain, the only thing to be done is to combat it by the usual means, if the dilatation of the os uteri is not sufficiently advanced to admit of an artificial termination of the labor. But in the contrary case, the accoucheur should apply the forceps at once, or resort to version, and thus relieve the patient as promptly as possible from the danger that threatens her.

ARTICLE I.

OF THE CAUSES OF UTERINE HEMORRHAGE.

The causes of uterine hemorrhage have been divided into the *predisposing*, the *determining*, and the *special* causes.

§ 1. Of the Predisposing Causes.

We must place in the front rank of the predisposing causes, all the disorders in the general circulation that are induced and kept up by pregnancy, and which are manifested by palpitations of the heart, by obstructed respiration, varicose swellings of the veins of the lower extremities, and by the fulness and greater activity of the pulse; but, above all, it is important, in order to understand the mode of action of the causes described below, to bear in mind the changes that have occurred in the structure of the womb itself; which changes have been studied in detail, when describing the anatomical phenomena of gestation, but which we again bring forward in a summary way, for the better illustration of the subject under consideration.

The mere fact of conception produces a state of orgasm in all the genital organs, the uterus particularly, which determines a considerable afflux towards these parts. In some women, of a sanguineous temperament, this state of irritation is not confined to the hypertrophy of the mucous membrane, but the development of its vascular apparatus is attended or followed by an exhalation of blood, and, in the course of a few days, a uterine hemorrhage takes place that seems to be only a menstrual return, but which, in reality, interrupts a commencing pregnancy. In certain cases, this fluxion is not limited to the uterine vessels; for, when very considerable, it causes an aneurismatic or a varicose swelling in the neighboring parts, such as the vessels of the broad ligaments, which run to the tube or ovary. These trunks occasionally give way, and produce a mortal hemorrhage, as Al. Leroy says he found to be the case in two women who died a few days after marriage.

During the first month of its intra-uterine life the ovum occupies only a very small portion of the uterine cavity, all the rest being filled with the pouch formed by the epichorial decidua and parietal mucous membrane; and hence, being free and floating, and having as yet contracted but feeble adhesions with the walls of the organ, the product of conception can only be developed by imbibing the juices secreted on the internal surface of the womb; (see *Nutrition of the Fœtus;*) which secretion requires a much greater activity in the circulation of the uterus, and may become a cause of flooding, under the influence of the least disorder. Somewhat later, the placenta begins to be developed, and with it those numerous vessels which, coming from the internal surface of the uterus, and the external one of the chorion, appear, so to speak, to run to meet each other; then they interlace without inosculating, and ultimately become united, forming a mass that is held together by a species of flaky lymph, a product of the uterine secretion.

Now, who does not see in this process of vascular organization, in this copious secretion that is constantly going on, and requiring so much activity in the circulation of the organ, a continual predisposition to hemorrhage? For, if any vivid moral impression, or any violent physical commotion, disturbs the harmony that presides over this new creation for a single instant, by causing a derangement in the circulation, the just relations established between the ovum and the womb are at once destroyed; and the blood, being forced too rapidly into these recently formed vessels, overcomes the resistance of their feeble walls, and a flooding results in consequence.

At a still more advanced period of the gestation, when the placenta is organized, the production of hemorrhagic accidents is singularly favored by the double circulation of which it is the seat, by the great development of the uterine vascular apparatus, and by the peculiar structure of the utero-placental vessels. Quite recently, M. Jacquemier has carefully studied the influence of each of these circumstances, and the following summary will serve to illustrate the results of his inquiries.

When we examine the uterus of a pregnant woman in the latter periods of gestation, after having undergone its usual transformations, we are struck with the development of its vascular system; for the trunks of the four arteries that nourish the organ have increased in size, and their divisions or ramifications in the texture of the womb are wonderfully multiplied. The vessels that existed before the impregnation have more than doubled their calibre, and a great number of others that did not exist, or rather were not visible, have successively formed, become enlarged, and attained a considerable size. We have hitherto mentioned (see art. *Pregnancy*) the extraordinary development of the uterine veins; and it is only necessary to recall here the feebleness of their walls, which are composed of a single coat, their adhesion to the uterine tissue, and the numerous divisions sent by them into the cavity of the organ, which penetrate directly or indirectly into the substance of the placenta itself. It results from this arrangement that, in the arterial system of the womb, the blood passes from trunks of a moderate size into cavities very numerous and spacious in proportion to the volume of the trunks; which cavities are formed by the numerous ramifications given off from the latter in the substance of the uterus; while, in the venous apparatus, a much greater disproportion exists between the trunks of the uterine and ovarian veins and their branches, so that the blood passes from very large cavities into narrower tubes.

This arrangement has been considered by M. Jacquemier as a cause of the retardation in the uterine circulation, and as being calculated to produce a venous stasis, followed by an engorgement of this system, and, as a consequence, the rupture of the vessels and hemorrhage; which venous rupture is further favored by the want of resistance on the part of the utero-placental veins. According to his view, all the causes under whose influence floodings are found to result, merely act by producing this engorgement of the uterine venous apparatus; and hence the immediate cause of hemorrhage is the rupture of one of the vessels appertaining thereto.

But we cannot fully embrace this theory, so far, at least, as regards the hemorrhages that occur during gestation, for we do not believe that the retardation in the circulation is so extensive as M. Jacquemier has described. Although the blood arriving by the uterine arteries passes into the larger cavities constituted originally by the arterial and afterwards by the venous ramifications (the uterine sinuses), yet it seems to us that this cause of delay would be compensated by the rapidity with which the blood contained in these venous capillaries must pass into the trunks where they empty; and even by virtue of that very law of hydraulics quoted by M. Jacquemier in favor of his theory, namely, "When a liquid flows in full stream through a tube, the quantity of this liquid which, at a given moment, traverses the different sections of the tube must everywhere be the same. *Consequently, as the tube becomes larger, the rapidity diminishes; but increases as the tube becomes smaller.*" If, therefore, the course of the blood is slackened in the arteries by its passage from the main trunks into the ramifications, it must be accelerated in the veins by its passage from the ramifications into the trunks; and hence there must be a compensation in its rapidity.

But an infinity of circumstances may destroy this harmony; and which series of vessels will then be the seat of the congestion, and afterwards of the rupture? M. Jacquemier supposes that some point of the venous system will always yield to the first; for he says, "Every part of the uterine vascular circle is not equally exposed to this species of rupture; *and the arteries would even be wholly exempt, unless they were the seat of some morbid lesion.* The utero-placental arteries themselves would rarely be a primitive seat of rupture from the mere impetus of the blood, although the surrounding delicate tissue in which they ramify supports them in a much less perfect manner than the elastic tissue of the womb, and besides is easily torn; but the utero-placental veins, from their situation and organization, can afford but a very *moderate* resistance, which will frequently be overcome." No doubt, the venous parietes are less resistant than the arterial ones; but which of the two has the greater stress to bear? Do not all the causes, under whose influence the uterine congestions and subsequent hemorrhages are produced, act first on the arterial, before being perceptible in the venous system? And is not the plethoric condition first manifested by a fulness of the pulse. M. Jacquemier supposes that, as the circulation is impeded in the vena cava inferior, it must determine a reflux of the blood contained in these vessels; which reflux would be primarily felt in the uterine veins, and then in their ramifications; and that this would likewise be favored by the particular structure of the uterine veins themselves, *which are destitute of valves.*

This absence of valves must certainly favor the reflux of the venous blood; and it is possible that, under the influence of some of the causes enumerated by this writer, a congestion and then a venous rupture might be the primitive phenomena; but we cannot admit that this is generally the case in the hemorrhages that occur during gestation. And whilst acknowledging that our friend has rendered an important service to the profession, by calling attention to a particular variety of mechanism in the production of uterine hemorrhages, we must persist in considering his theory as being only applicable to a small number of cases. (See *Archives Générales de Médecine*, 1839.)

I must yet bring forward another anatomical peculiarity, which, perhaps, will serve to reconcile two conflicting opinions. It has been said by some persons that all uterine hemorrhages proceed from a separation of the placenta; while others contend that many of them result simply from an exhalation of blood from that portion of the internal surface of the womb not occupied by the placental insertion. Doubtless, the floodings that occur during pregnancy are most frequently caused by a rupture of one or more of the utero-placental vessels; but it is not to be supposed that this rupture is the only source of hemorrhage, for we have already seen that, in the early months of gestation, the ovum only occupied the uterus in part, all the rest of its cavity being filled with the tumefied and very vascular mucous membrane, and that, in consequence of the greater activity of the circulation, an exhalation of blood might take place from the internal surface of the womb. (See page 552.) This fact is unquestionable; but even after the placenta is completely formed, and the ovum occupies the whole cavity of the womb, there are still, as described elsewhere, some arterial and more particularly some venous radicles found existing externally to the placental mass, that might give rise to a hemorrhage, in which the proper utero-placental relations would be in no wise concerned.

From the foregoing, it would appear that a hemorrhage may take place during gestation: 1st, by sanguineous exhalation from torn capillary vessels, especially during the early stages; 2d, from a rupture of the veins, and oftener, of the utero-placental arteries, properly so called; 3d, from a rupture of the veins and arterioles that ramify in the substance of the decidua beyond the placenta.

Among the anatomical modifications impressed on the uterus by gestation, the development of its muscular structure has recently been pointed out by M. Gendrin as a predisposing cause of hemorrhage. At the close of pregnancy, the womb is formed of three evident layers; and it is the relation of these three muscular laminæ with the vascular one that explains, according to his view, the influence that it has over the production of flooding.

This triple muscular layer may, under the influence of various external or internal irritants, become affected with spasms, which produce irregular contractions in some part of the organ. He states that such spasmodic contractions are very frequent after the third month, and [illegible] often declare they have taken every precaution to avoid all sources of error; consequently, I admit that this rupture may take place, Madame Lachapelle and Boivin, and M. Velpeau, to the contrary notwithstanding. In such cases, the rupture has doubtless been favored by an abnormal weakness in the vascular walls, and by the diminished resistance of the sheath that surrounds the vessels; but it may be more particularly attributed to the tensions on the cord itself, that are probably produced before the membranes give way, by the immoderate movements of the fœtus; which movements are probably excited by the annoyance that the turns of the cord occasion it. After the discharge of the waters, and during the expulsion of the child, the shortened cord becomes stretched, and its tension augments as the head approaches the vulva; when, as a general rule, its rupture alone can permit the expulsion to be effected.[1]

According to most accoucheurs, this unusual shortness of the cord may give rise to flooding by determining a premature detachment of the placenta. But it appears to me that such a separation can scarcely occur from a mere dragging on the cord, because, during the uterine contraction, the placenta is strongly pressed by the womb externally, and by the amniotic liquid internally, or, still more, after the escape of the waters, by the body of the child. Now, these parts must evidently react on the fœtal surface of the after-birth with all the force of impulsion communicated by the contraction; of course, the fœtus can only advance, and, consequently, the tension of the cord can only take place under the influence of this contraction; and I repeat that, while it lasts, the placenta is moulded on and forcibly pressed against the parts contained within the sac, and, of necessity, cannot be separated from the womb. I believe, therefore, that a separation of the placenta from a tension of the cord is almost impossible during the continuance of the contraction; but it may take place before or during the labor, and prior to the escape of the waters, if the cord be very short and the movements of the fœtus are very active. As to those cases, in which it is commonly said the child is born with a caul, that is, where the head pushes the membranes before it, it may happen that the dragging to which these latter are subjected, being communicated to the placenta, may occasion its premature separation and give rise to uterine hemorrhage; more particularly where this body is not attached directly to the fundus of the organ.

§ 3. RAPID CONTRACTION OF THE UTERUS.

Sudden and rapid contraction of the womb may likewise produce a disastrous hemorrhage, by destroying the cellulo-vascular attachments of the placenta; for this contraction, which, when restricted to proper limits, is a physiological condition of labor, becomes a cause of premature separation of the placenta, when it takes place too rapidly or at too early a continued and over-excitation in all the genital organs; and, lastly, why every circumstance calculated to determine or to keep up an unusual activity in the general circulation, and particularly a more considerable afflux of fluids towards the gestatory organ, has been at all times considered as predisposing the woman to hemorrhage; such, for instance, as fatigue, the frequentation of balls, of plays, and crowded assemblies, where the air is impure and at a high temperature; prolonged watching; overheating diet, and the use of alcoholic drinks; as well as all local irritants, such as the abuse of drastic purgatives, which, by producing excessive irritation of the intestines, may react on the uterus; hip-baths, the frequent application of leeches to the vulva, the existence of any organic alteration, or an acute inflammation in the neighboring organs, or in the womb itself; because all these circumstances are calculated to maintain an habitual state of congestion toward the womb.

---

[1] For further details relative to the rupture of the cord, see the observations of Portal, *Pratique des Accouchements*, p. 267; Lamotte, *Traité des Accouchements*, p. 362; Levret, *Accouchements Laborieux*, p. 199; Baudelocque, *Recueil Periodique de la Société de Médecine de Paris*, t. iii., p. 1; Nægèle, *Annales Cliniques d'Heidelberg*, 1826; and of Busch, *Siebold's Journal*, ann. 1828.

§ 2. DETERMINING CAUSES.

The prolonged action of the predisposing causes just enumerated may eventually produce a hemorrhage; and thus, after having acted for a long time as the predisposing, finally become determining causes. But in addition to these, some other circumstances have been enumerated by authors, which might be designated as *accidental determining causes.* These are so numerous and varied that, to exhibit them, it would be necessary to bring forward nearly all of the cases that have ever been published. Besides, all these causes may be referred either to acute moral emotions, or to physical disturbances; for example, to a violent passion; the sudden arrival of some unexpected person or intelligence; a fit of anger; sharp bickerings, &c.; to the jolting of a rough carriage; to riding on horseback; a fall on the feet or nates; blows on the abdomen; efforts to carry or lift some burden; to cough, vomiting, &c., &c., &c. (See art. *Abortion.*)

But these causes, the list of which I might have lengthened greatly, do not all have the same mode of action; for some of them, such as most of the moral ones, act primarily on the whole organism, and only react on the womb secondarily; while others, like the generality of the physical causes, are addressed, as it were, directly to the gestatory organ, and, by the shock they communicate, have a tendency to disturb the relations existing between it and the product of conception. It is generally conceded that the former determine a more considerable afflux of blood towards the uterus, than an engorgement of the utero-placental vessels, and finally the rupture of those vessels; or, if the pregnancy is but little advanced, the afflux of blood is followed by a sanguineous exhalation from the internal surface of the organ. But how, it may be asked, is the hemorrhage produced after a fall, blow, or any physical commotion whatever, especially in the latter stages of the gestation? And is the separation of the placenta, which is then a very common occurrence, the primitive phenomenon, and has it caused a vascular rupture? Or, indeed, has this rupture taken the precedence, and has the effusion of blood between the after-birth and the uterus resulting therefrom produced the separation of the placenta? The latter opinion appears to me the more probable; for, although there can be no doubt that the feeble bonds of union which attach the placenta to the uterus may be ruptured at once, as a consequence of some very violent shock or fall from an elevated place, since, under like circumstances, the very substance of the solid organs, the liver in particular, has been lacerated, yet this certainly does not happen in a large majority of cases; because the ovum forms a full sac, which is in immediate contact with the walls of the cavity that incloses it, and the placenta is sustained by the waters and the fœtus within and by the uterine wall without. The organ and its contents constitute a whole, that cannot be separated by any general concussions unless they are very severe. Wherefore, so long as the membranes remain unruptured, it is difficult to conceive that the separation could be effected otherwise than by the effort of the blood to escape into the cavity of the womb.

In conclusion, although these physical and moral disturbances are enumerated by authors as being capable of producing a hemorrhage, it must not be supposed that they constantly have this unfortunate result; indeed, their influence is far from being always in proportion to their violence and intensity. In general, they only act and are followed by flooding, because a predisposition exists in the patient which the determining cause excites and brings into play. I might mention individuals in whom the least excitement has been followed by a hemorrhage that proved fatal to the fœtus, whilst others have borne the most severe moral disturbances without accident; and several cases were cited in the article on Abortion, which prove that the most violent physical shocks oftentimes give rise to no disorder whatever. We must, therefore, admit the intervention of a predisposing cause in the majority of cases; a cause which often, indeed, plays the most important part in the production of the accident.

§ 3. SPECIAL CAUSES.

Independently of the general causes just studied, there are some which might be termed special causes, because they depend on certain peculiarities in the position and structure of the ovum; and the influence of which is particularly apt to be felt at an advanced stage of gestation. We allude to an abnormal insertion of the placenta, to a rupture of the umbilical cord, and to some other peculiarities about to be mentioned.

1. *Insertion of the Placenta upon the Lower Segment of the Uterus.*—Nearly all the older authors detail cases in which the placenta was found inserted over the neck of the womb at the time of labor. But some of them altogether misunderstood the cause of this disposition, and supposed that the placenta had been detached in totality from the point where it was originally inserted, and had fallen from mere gravity on the neck of the womb; while others, who had observed it to be still adherent by one margin to some point of the periphery of the cervix, concluded that this adhesion was only accidental and merely occasioned by the clotted blood; *which, says Deventer, sometimes glues the placenta so closely to the orifice that it might be taken for an excrescence of the part.* There were others, again, who had noted the fact with much care, without attempting to give any explanation of it; Levret was among the first to direct attention to this important point, for he demonstrated its frequency and danger, and studied the causes and proper methods

of detecting it. However, this abnormal insertion had been pointed out long before the time of Levret; for Giffart, in narrating a case of hemorrhage, wrote, in 1730: "I cannot receive as absolutely true the opinion of those authors who say that the placenta is always attached to the fundus uteri, for in this case, as in many others, I have every reason to believe that it adhered on the internal orifice, or very near to it; and that, in dilating, the latter occasioned the separation of the after-birth, and as a consequence the hemorrhage." (*Observ.*, 115 et 116.) Heister (*Institutiones Chirurgicales*, chap. cliv. part i.) likewise says: "Some moderns think that the adhesion of the placenta over the neck is a cause of hemorrhage; and, therefore, that the more the os uteri dilates the more abundant is the flooding." Finally, we find in Portal's work, which appeared in 1685, observations which show conclusively that he is entitled to the honor of having first described this faulty insertion. In six of his cases, *the placenta presented, was in entire contact with the orifice of the womb, and was adherent throughout.* The author even endeavors to show how the hemorrhage occurs in these cases, giving the explanation which was afterwards accepted by Levret and many others.

As we detailed the various circumstances, when studying the anatomy of the placenta, which, according to most authors, determine the point of attachment of this vascular mass, it will be unnecessary to revert to them here. We would merely observe that the placenta has various relations with the orifice, giving rise to several grades or varieties of faulty insertion. Thus, the placenta may be inserted near the orifice or on the orifice, covering it entirely or in part. These various insertions have received different names, as, *marginal*, when the placenta extends very near the circumference of the orifice; *incomplete* or *partial*, when it covers it only in part; *complete* or *central*, when it covers it entirely; and, finally, we have the term *intra-cervical* insertion when, as seems to be proved by some cases of Madame Lachapelle's, the ovum has happened to insert itself in the cavity of the neck itself. Further observations are, however, required to establish the latter as a true variety.

[According to Dr. Sirelius, the placenta undergoes important changes in form whenever it happens to be attached over the mouth of the womb. Sometimes, though rarely, it is spread out in a membraniform layer over almost the entire surface of the chorion (membranous placenta); at other times there are two separate placentas, one large and the other small; but most commonly it is imperfectly divided by a fissure extending from the free edge to its middle, giving it a horseshoe form. In the two latter cases the fissure, which either completely divides the placenta or leaves it in the form of a crescent, is occasioned by obliteration of the villi of the chorion, and always corresponds to the internal orifice of the uterus. This remark in reference to the pathological anatomy of the case may have a practical application in regard to the treatment.]

The insertion of the placenta over the os uteri has been considered, since the days of Levret, as an inevitable cause of hemorrhage during the last three months of gestation, and in the course of the parturition. The flooding, then, says Gardien, is an immediate result of the gestation, and particularly of the labor. Most modern writers, supposing that the modifications occasioned by pregnancy in the disposition of the neck towards the latter months are the sole cause of the hemorrhages that then occur, have adopted the same opinion; and the following, in their view, is the mechanism whereby the discharge is produced. Up to the fifth month, the body of the womb undergoes numerous changes, but after that period, the neck is also involved and participates therein. (See *Pregnancy.*) The diminution in its length is accompanied by a more considerable enlargement of its base on a level with the internal orifice. The placenta, being fixed and immovable on the spot where it is implanted, cannot follow this spreading out of the upper part of the neck, and hence the bonds of union which it has contracted with the womb necessarily become ruptured, as do also the utero-placental vessels; and this rupture produces a more or less considerable discharge.

But it is only necessary to recall what was stated in the article on Pregnancy, to be convinced that this explanation, which is founded on a false, though hitherto admitted fact, ought to be rejected; since it is at the lower part of the neck, at least in women who have previously borne children, that the eversion of its cavity commences; and, in all, the internal orifice often remains closed until the last few weeks of gestation. The neck, therefore, does not spread out at its superior part, and, consequently, we are not to search there for the cause that produces the hemorrhage, when the placenta is inserted over the cervix. The following explanation, by M. Jacquemier, appears to me more plausible: During the first six months of gestation the uterus is developed more especially at the expense of the fibres of the superior part of the body or fundus of the organ; while in the last three months, the fibres appertaining to the lower third of the womb are developed in a rapid manner, and the cavity of the organ is enlarged in consequence of the distention and growth of this lower part; a proof of which is, that the body of the uterus, which was pyriform in the earlier months, is perfectly ovoidal in shape towards the close of pregnancy; and I will further remark, that the development of the placenta is far more rapid in the first six than in the last three months. Now, this double circumstance seems to me quite sufficient to account for the production of hemorrhage; for when the placenta is attached to the fundus, its growth is simultaneous with the enlargement of that portion of the uterine walls on which it is implanted, and it is evident that no hemorrhage need occur; but when the after-birth is inserted over the cervix uteri, or on some adjacent point, the contrary must necessarily ensue, because the growth of the placenta is nearly completed, whilst a more considerable extension of the lower third of the womb has yet to take place. Of course, the placenta can no longer participate in this rapid development, by conforming to the increase of the uterus, and by following the extension of the wall on which it is inserted; and hence it spreads out from the centre towards its circumference, the fissures between the cotyledons become larger, and its different lobes are thus widely separated; but the growth of the inferior wall of the uterus is so rapid in the latter months, that this mechanical enlargement of the placenta, on which M. Jacquemier has particularly insisted, is no longer sufficient to prevent the tension of the utero-placental vessels, or of the cellular tissue in which they ramify; and this tension being ultimately carried to an extreme, all of these cellulo-vascular adhesions give way and become ruptured, and thus give rise to the production of hemorrhage. If this be the true explanation, there is no necessity for invoking a diminution in the length, and a spreading out of the upper part of the neck, which really does not take place. By it we can also comprehend the possibility of a circumstance that is inexplicable under the theory generally received,—I allude to the hemorrhages that occur when the placenta is attached to the lower part of the womb, or some point adjacent to the internal orifice; for it is not because the afterbirth is implanted over the cervix that a flooding takes place during the latter months of pregnancy, but because it is in relation with the inferior third of the uterus.

The explanation usually given is true only with regard to those sanguineous discharges that come on in the latter weeks of gestation or during the parturition; for then, the spreading out of the cervix uteri, and its complete effacement, must necessarily have a great influence over the production and profuseness of the flooding, in those cases where some point of the circumference of the placenta is in immediate relation with the neck; but still more especially in those where the insertion takes place, as it is said, centre for centre.

The hemorrhages of which we are speaking occur, besides, most frequently in the latter weeks or during the labor.

Although a hemorrhage is usually considered to be inevitable under such circumstances, yet it may not appear even during the labor; and the dilatation of the os uteri may be effected without the loss of a drop of blood. This absence of discharge is doubtless a rare circumstance; but its authenticity at the present day is well established by numerous cases; authors only differing as to the explanation given of it. Thus Walter supposes that in cases of this kind there is probably a larger and more easy communication between the venous and arterial radicles of the uterus than usual, whereby the blood may pass from the arteries into the veins without escaping externally; and M. Mercier imagines that the exhalant vessels of the womb are then in a state of constriction, of perversion of their sensibility, which is sufficient to retard the course of the blood; but these two explanations appear to me inadmissible. M. Moreau remarks that, in the reported cases, the children were dead, and perhaps had been so for several days; now, says he, as soon as the infant dies in the womb, the cessation of the fœtal circulation occasions changes in that organ; the blood being arrested in the vessels, coagulates there; the latter retract, or even become obliterated, and no more blood reaches the womb than what is necessary to its nutrition, since the stimulus that heretofore determined a greater quantity to it, no longer exists; and hence the dilatation of the orifice may be effected without hemorrhage, notwithstanding the vessels are torn that united its borders to the placenta. It seems to me that, in spite of objections raised against it, this view is correct, at least as regards some cases. In others, it may be as M. Jacquemier remarks, that the accomplishment of the delivery without accident is due either to the entire separation of the placenta, or to its detachment on one side only to a point just beyond the uterine orifice; so that the dilatation can progress without increasing the detachment; the vessels previously torn having been stopped by coagulated blood. Thus we may account for cases in which hemorrhage had occurred several times during pregnancy, without reappearing at the time of labor.

Lastly, if the rupture of the membranes should occur at the commencement of labor, it is possible that the uterine retraction which would naturally follow a discharge of the waters, and the compression that would be made by the head on the part left uncovered by the separation of the placenta, might entirely obliterate the lacerated vessels, and thus put an end to the hemorrhage; and yet the fœtus be living.

2. *Rupture of the Cord, or one of its Vessels.*—It is now an incontrovertible fact that a rupture of the umbilical vessels, or of the omphalo-placental trunk itself, may take place; and, inexplicable as it may seem, it can no longer be called in question, since it has been successively observed by such men as Delamotte, Levret, Baudelocque, Nægèle, &c. This rupture, and the hemorrhage to which it inevitably gives rise, may be occasioned either by some disease of the vascular tunics, by a particular arrangement of the vessels of the cord, or by a brevity of the latter, whether this be natural or dependent on numerous turns made around different parts of the fœtus.

A. "The umbilical vessels," says M. Velpeau, "are sometimes ruptured: I am in possession of several examples of the kind; but it is because they were previously in a diseased state." In a case reported by M. Deneaux, the blood escaped through the umbilical vein, which was varicose at several points. The subjoined curious instance, which I reported in my Inaugural Thesis, might probably be attributed to a state of disease in the ramifications of the vessels of the cord; in this case, the hemorrhage occurred between the chorion and the fœtal surface of the placenta, in consequence of a rupture of all the ramifications of the umbilical vessels. This case, which I believe is unique, and hitherto but little known, has generally been misinterpreted by those who have referred to it, and I therefore feel justified in republishing it here.[1] I must confess, that it is not without some hesitation that I attribute the flooding, in this instance, to a previous disease and rupture of the umbilical vessels. For, might not such a rupture be

---

[1] Rocques-Marie-Joseph Herce, aged twenty-nine years, pregnant for the fifth time, and advanced to the seventh month of gestation, was brought to the Hôtel-Dieu on the fifth of May, at midnight. The midwife that accompanied her informed us that she had had sharp pains since five o'clock in the evening. The patient appeared much enfeebled; her face was pale and slightly jaundiced; and this debility had been caused, the midwife further told us, by a hemorrhage that had lasted since the fourth month of pregnancy. The flooding had considerably increased from the moment the pains began; and it was owing, added the attendant, to an implantation of the placenta over the os uteri. The patient was placed in the ward of Saint-Benjamin, where we made a vaginal examination, the result of which was as follows: The os uteri was dilated to the size of a five-franc piece, and the cervix was soft, wholly effaced, and did not contract at all. The finger, having been introduced into the uterine orifice, detected a hard, resistant, ovoid body, which we recognized as the fœtal head in the first position. No soft body whatever was interposed between our finger and the cranial teguments, and we concluded that, if the placenta were inserted over the neck, it was not at least by its centre. By carrying the semi-flexed finger around the internal periphery of the neck, we endeavored to ascertain whether the after-birth was not attached to one of the lips of the orifice; but as we found nothing of the kind, the error of the midwife was manifest, and though unable to determine the cause of the hem-

---

orrhage, we did not hesitate to reject her opinion. The finger being still in the orifice, we felt the womb contracting moderately, in consequence, probably, of the irritation produced by the touch. The hemorrhage was arrested, the head engaged at the superior strait, and the patient, though feeble, still retained a sufficient degree of strength to second the efforts of nature. We thought there was nothing further to be done than to encourage the woman about her condition, and to persuade her to aid the uterine contractions that began to be developed quite strongly, as much as possible. In fact, the labor advanced very well, without a return of the hemorrhage, and at four o'clock in the morning she was delivered of a dead child of seven months, which was pale and colorless, but exhibited no signs of putrefaction. Its delivery was followed by the expulsion of three large clots of blood, each of which was as big as the fist; but the flooding was not again renewed. The cord was about the usual length, and there was no circulation in it; but we were not a little surprised, after having cut it, to find that it was no longer attached to the mother; but that it exhibited, on what should have been the placental extremity, a kind of membrane, in the centre of which it seemed to be implanted. The membrane was nearly as large as an ordinary placenta, and was evidently continuous with the debris of the bag of waters; and we at first supposed it to be one of those membranous placentas spoken of by authors. This view appeared the more probable, as some vessels, evidently arising from the termination of the cord, ramified in its substance. We then thought the opinion of the midwife might possibly be correct, as the want of thickness in the placenta might have prevented us from recognizing it. When we returned to the patient, at eight o'clock in the morning, we found her doing very well; but what was our astonishment, when the nurse brought forward a placenta, which the woman had expelled after our departure! Thenceforth all our suppositions were groundless, and it was necessary to resort to an examination of the pieces for a better explanation of the phenomena offered by this patient. The following was the result, as all the members of the Anatomical Society have since been enabled to verify: The uterine face of the placenta was smooth and normal, but its fœtal surface was entirely deprived of the portion of chorion that ought to cover it, and was irregular, nodulated, and clearly exhibited the anfractuosities that separate the cotyledons. It was covered over by thick clots, and the debris of the torn and separated vessels that ordinarily ramify on its surface could readily be detected; the loose extremity of some of these vessels was an inch long. By a further careful examination of that portion of the pouch hanging to the cord, which we had taken for a membranous placenta, we were enabled to detect on the surface that covered the after-birth, some vascular debris, which had been continuous with those observed on the fœtal surface of the placental mass. The cavity of these vessels was patulous, and some were obstructed by fibrous coagula of recent formation. The principal divisions were intact and permeable to the blood.

From that examination, we felt authorized to conclude: 1. That the placenta was not inserted over the neck; 2. That the hemorrhage was not produced by a detachment of the uterine surface of the after-birth; but that it resulted from a separation of that portion of the bag of waters that was attached to the after-birth; that this separation was effected at first on some point of the fœtal surface of the placenta, then over a greater extent, and finally separating this mass altogether from the fœtal envelopes; 3. That, becoming more and more considerable, this separation had produced a gradual increase of the hemorrhage; and it was only when the detachment had been completed, and the bleeding had become excessive, and all communication being interrupted between the mother and child, that the pains were manifested, and the abortion took place. This examination likewise enabled us to account for the cessation of hemorrhage from the time of the patient's arrival at the hospital, as also for the quantity of coagulated blood that escaped after the delivery of the child. In fact, as soon as we touched the woman at the time of her entrance, the head began to are certain peculiarities dependent on the various causes indicated above that demand attention, and which will be pointed out in detail in the following article. (See *Diagnosis.*)

B. *Internal Flooding.*—An internal discharge may take place during the earlier months of pregnancy, and yet may escape detection; if, however, the amount of blood should be considerable, the clot formed by its coagulation constitutes a foreign body, whose presence excites colicky gripings, and pains in the loins, and a feeling of weight about the fundament; and these symptoms obstinately persist until a miscarriage takes place. Besides which, as M. Baudelocque remarks, there are some instances where the symptoms of occult hemorrhage are either preceded, accompanied, or followed by an external discharge of blood. In the former case, the blood finding a free issue outwardly, continues to escape until its further passage is prevented by the formation of a coagulum, which forces it to accumulate internally; in the latter, the effusion of blood into the cavity constantly goes on, until it reaches the orifice of the womb by gradually separating the membranes; while, in the third case, an external discharge will accompany the occult hemorrhage whenever one part of the blood has a free issue, but the other collects in the cavity of the organ.

At an advanced stage of the gestation, when the hemorrhage is more profuse, we must add to the precursory signs before mentioned a considerable and rapid development of the belly, and a greater resistance, tension, and hardness of the uterus than usual; sometimes even it presents a very irregular form, seeming to be divided into two parts, one of which is occupied by the ovum, and the other by the effused blood; and most generally the active movements of the fœtus disappear. In some few cases, a well-marked fluctuation has been detected.

Finally, when the flooding is first manifested in the course of the labor, the interval of each pain is characterized by the escape of clots of blood in greater or less profusion. This discharge of coagula can be explained by the fact that, during the interval, the child's head does not seal up the neck hermetically, and thus its orifice is left comparatively free, and the blood is permitted to escape.

Seat of the Effusion.—The point at which the accumulation of blood takes place in those internal hemorrhages that come on at an advanced period of gestation must necessarily vary, according to the part of the utero-fœtal vascular apparatus which has been the source of the flooding. For instance:—

1. The blood may be primarily effused between the uterine face of the placenta and the corresponding uterine wall; as the discharge progresses, it ordinarily dissects off the placenta towards some one point of its circumference, and is then effused all round the ovum, by displacing the membranes. But it may also happen that the whole placental circumference remains adherent to the womb, whilst its central portion is entirely detached, the effusion being limited by the margins of this mass; and the hemorrhage may be copious enough in such instances to kill the patient promptly, as the case of Laforterie (whatever may be said of it) fully proves.

The reader will likewise find, in the *New Medical and Physical Journal*, (1813, No. 38, p. 535,) the following case, which, though less known in

France than the one of Laforterie, is not the less extraordinary: "A lady, of a weakly constitution and delicate habit, was attacked in the latter months of pregnancy with a slight discharge of blood from the vagina, not amounting altogether to half an ounce, accompanied with alarming symptoms of exhaustion and debility. The os uteri was scarcely dilated to the size of a sixpence, and was in such a state of rigidity as precluded the possibility of affording any manual assistance. The lady in consequence died; and, on examination after death, it was found that a separation of the centre of the placenta from the parietes of the uterus had taken place, whilst its edges were completely adherent, forming a kind of cul-de-sac into which blood had been poured to the amount of a pint and a half, which had become coagulated within the cavity thus formed."

2. The blood may be effused into the proper tissue of the placenta, and thereby constitute those sanguineous collections which have been designated of latter time as *placental apoplexy.* The woman's life is never compromised by a discharge of this nature, but the death of the fœtus and, as a consequence, its premature expulsion, most generally results therefrom.

3. The blood may be effused on the fœtal surface of the placenta, as in the case referred to above; but the flooding here evidently must have been internal before it was external. Indeed, several observers have reported that they found coagula lying between the chorion and a portion of this fœtal aspect of the placenta.

4. The numerous observations detailed in the memoir of M. C. Baudelocque, prove that blood may be effused between the various membranous laminæ that constitute the amniotic sac, at all stages of pregnancy.

5. Lastly, notwithstanding the strictures which the cases narrated by Delamotte, Levret, Nægèle, Baudelocque, and others have been subjected to, they constrain us to believe that both a partial and complete rupture of the umbilical cord may take place; in consequence of which an effusion of blood is made into the cavity of the amnion.

ARTICLE III.

DIAGNOSIS.

A. *External Discharge.*—The difficulties hitherto described, (see *Diagnosis of Abortion,*) as complicating the diagnosis of hemorrhage during the first six months of pregnancy, are scarcely ever met with at a more advanced period. In fact, it is so rare to find women regular as late as the last three months, that every discharge of blood from the vulva at that period may be considered as a symptom requiring immediate attention; for, at the most, we could only confound a very slight hemorrhage with a return of the menstrual discharge, and, in both cases, the precautions to be taken would be the same; or, at least, if indifferent in the one, they might prove very serviceable in the other.

When a hemorrhage does come on in the course of the last three months of gestation, or during labor, the question arises, what is the cause? But this question, though very important both as regards the prognosis and the treatment, is sometimes exceedingly difficult to answer. It has been shown that often, perhaps even, according to certain authors, the most frequently, are certain peculiarities dependent on the various causes indicated above, that demand attention, and which will be pointed out in detail in the following article. (See *Diagnosis.*)

B. *Internal Flooding.*—An internal discharge may take place, during the earlier months of pregnancy, and yet may escape detection; if, however, the amount of blood should be considerable, the clot formed by its coagulation constitutes a foreign body, whose presence excites colicky gripings, and pains in the loins, and a feeling of weight about the fundament; and these symptoms obstinately persist until a miscarriage takes place. Besides which, as M. Baudelocque remarks, there are some instances where the symptoms of occult hemorrhage are either preceded, accompanied, or followed by an external discharge of blood. In the former case, the blood, finding a free issue outwardly, continues to escape until its further passage is prevented by the formation of a coagulum, which forces it to accumulate internally; in the latter, the effusion of blood into the cavity constantly goes on, until it reaches the orifice of the womb by gradually separating the membranes; while, in the third case, an external discharge will accompany the occult hemorrhage whenever one part of the blood has a free issue, but the other collects in the cavity of the organ.

At an advanced stage of the gestation, when the hemorrhage is more profuse, we must add to the precursory signs before mentioned a considerable and rapid development of the belly, and a greater resistance, tension, and hardness of the uterus than usual; sometimes even it presents a very irregular form, seeming to be divided into two parts, one of which is occupied by the ovum, and the other by the effused blood; and most generally the active movements of the fœtus disappear. In some few cases, a well-marked fluctuation has been detected.

Finally, when the flooding is first manifested in the course of the labor, the interval of each pain is characterized by the escape of clots of blood in greater or less profusion. This discharge of coagula can be explained by the fact that, during the interval, the child's head does not seal up the neck hermetically, and thus its orifice is left comparatively free, and the blood is permitted to escape.

Seat of the Effusion.—The point at which the accumulation of blood takes place in those internal hemorrhages that come on at an advanced period of gestation must necessarily vary, according to the part of the utero-fœtal vascular apparatus which has been the source of the flooding. For instance:—

1. The blood may be primarily effused between the uterine face of the placenta and the corresponding uterine wall; as the discharge progresses, it ordinarily dissects off the placenta towards some one point of its circumference, and is then effused all round the ovum, by displacing the membranes. But it may also happen that the whole placental circumference remains adherent to the womb, whilst its central portion is entirely detached, the effusion being limited by the margins of this mass; and the hemorrhage may be copious enough in such instances to kill the patient promptly, as the case of Laforterie (whatever may be said of it) fully proves.

The reader will likewise find, in the *New Medical and Physical* (1813, No. 38, p. 535,) the following case, which, though less l period of the travail. This is apt to occur in cases of dropsy of the amnios, where a large quantity of the waters escapes at once; for the uterus then passes from an enormous bulk to a much more circumscribed volume than what comports with the dimensions of the fœtus on which it is applied. It likewise happens after the expulsion of the first child in twin pregnancies; for the contraction that follows this process may, by separating the placenta appertaining to the other twin, cause a flooding that might prove fatal to both mother and child, if a long interval should elapse between the two deliveries.

The hemorrhages that so often complicate a rupture of the body or neck of the womb, and those which constitute the thrombus of the vulva and vagina, have already been considered in separate articles, and we shall not again revert to them here.

ARTICLE II.

SYMPTOMS OF UTERINE HEMORRHAGE.

The symptoms of uterine hemorrhage may be divided into *general* and *local*.

1. *General Symptoms.*—In some cases, the flooding commences in so sudden and rapid a manner that the discharge of blood is the first symptom manifested; this is more apt to occur in those instances where the hemorrhage follows the violent action of some external cause. Most generally, the woman experiences, during the few days preceding the accident, some uneasiness in her limbs, a general and unusual malaise, a sensation of weight and of numbness in the pelvis, and a dull and obscure pain in the loins, in the upper part of the thighs and groins, which is augmented by the erect position, by strainings at stool, and by the act of urinating; and, in many cases, there is a constant desire to pass the urine. These phenomena, which are characteristic of a local uterine congestion, are accompanied by the symptoms of general plethora; that is to say, by pains in the head, vertigo, dimness of vision, flushing of the face, and by frequency and fulness of the pulse. After these general disorders have lasted some days, it is not unusual for the active movements of the fœtus to die away, and to become very feeble, or, perhaps, not at all perceptible to the patient. After the lapse of some time, varying from a few hours to several days, these precursory phenomena give way to the general symptoms of hemorrhage, which are the same as accompany every loss of blood: namely, pallor of the skin, feebleness of the pulse, and coldness of the extremities; the intensity of which, it is needless to add, varies according to the abundance and rapidity of the flooding, the strength of the woman, &c., &c.

2. *Local Symptoms.*—With regard to the local symptoms that characterize its existence, uterine hemorrhage has been divided into the external and the internal. The flooding is called external, when the blood flows to the exterior, and internal, when it is effused into the cavity of the organ; but we shall hereafter see that it may be both external and internal at the same time.

A. *External Flooding.*—A discharge of blood externally is of itself a sufficient sign of hemorrhage during pregnancy or parturition; but there are certain peculiarities dependent on the various causes indicated above, that demand attention, and which will be pointed out in detail in the following article. (See *Diagnosis.*)

B. *Internal Flooding.*—An internal discharge may take place, during the earlier months of pregnancy, and yet may escape detection ; if, however, the amount of blood should be considerable, the clot formed by its coagulation constitutes a foreign body, whose presence excites colicky gripings, and pains in the loins, and a feeling of weight about the fundament ; and these symptoms obstinately persist until a miscarriage takes place. Besides which, as M. Baudelocque remarks, there are some instances where the symptoms of occult hemorrhage are either preceded, accompanied, or followed by an external discharge of blood. In the former case, the blood, finding a free issue outwardly, continues to escape until its further passage is prevented by the formation of a coagulum, which forces it to accumulate internally; in the latter, the effusion of blood into the cavity constantly goes on, until it reaches the orifice of the womb by gradually separating the membranes; while, in the third case, an external discharge will accompany the occult hemorrhage whenever one part of the blood has a free issue, but the other collects in the cavity of the organ.

At an advanced stage of the gestation, when the hemorrhage is more profuse, we must add to the precursory signs before mentioned a considerable and rapid development of the belly, and a greater resistance, tension, and hardness of the uterus than usual; sometimes even it presents a very irregular form, seeming to be divided into two parts, one of which is occupied by the ovum, and the other by the effused blood; and most generally the active movements of the fœtus disappear. In some few cases, a well-marked fluctuation has been detected.

Finally, when the flooding is first manifested in the course of the labor, the interval of each pain is characterized by the escape of clots of blood in greater or less profusion. This discharge of coagula can be explained by the fact that, during the interval, the child's head does not seal up the neck hermetically, and thus its orifice is left comparatively free, and the blood is permitted to escape.

Seat of the Effusion.—The point at which the accumulation of blood takes place in those internal hemorrhages that come on at an advanced period of gestation must necessarily vary, according to the part of the utero-fœtal vascular apparatus which has been the source of the flooding. For instance:—

1. The blood may be primarily effused between the uterine face of the placenta and the corresponding uterine wall; as the discharge progresses, it ordinarily dissects off the placenta towards some one point of its circumference, and is then effused all round the ovum, by displacing the membranes. But it may also happen that the whole placental circumference remains adherent to the womb, whilst its central portion is entirely detached, the effusion being limited by the margins of this mass; and the hemorrhage may be copious enough in such instances to kill the patient promptly, as the case of Laforterie (whatever may be said of it) fully proves.

The reader will likewise find, in the *New Medical and Physical Journal*, (1813, No. 38, p. 535,) the following case, which, though less known in

France than the one of Laforterie, is not the less extraordinary: "A lady, of a weakly constitution and delicate habit, was attacked in the latter months of pregnancy with a slight discharge of blood from the vagina, not amounting altogether to half an ounce, accompanied with alarming symptoms of exhaustion and debility. The os uteri was scarcely dilated to the size of a sixpence, and was in such a state of rigidity as precluded the possibility of affording any manual assistance. The lady in consequence died; and, on examination after death, it was found that a separation of the centre of the placenta from the parietes of the uterus had taken place, whilst its edges were completely adherent, forming a kind of cul-de-sac into which blood had been poured to the amount of a pint and a half, which had become coagulated within the cavity thus formed."

2. The blood may be effused into the proper tissue of the placenta, and thereby constitute those sanguineous collections which have been designated of latter time as *placental apoplexy*. The woman's life is never compromised by a discharge of this nature, but the death of the fœtus and, as a consequence, its premature expulsion, most generally results therefrom.

3. The blood may be effused on the fœtal surface of the placenta, as in the case referred to above; but the flooding here evidently must have been internal before it was external. Indeed, several observers have reported that they found coagula lying between the chorion and a portion of this fœtal aspect of the placenta.

4. The numerous observations detailed in the memoir of M. C. Baudelocque, prove that blood may be effused between the various membranous laminæ that constitute the amniotic sac, at all stages of pregnancy.

5. Lastly, notwithstanding the strictures which the cases narrated by Delamotte, Levret, Nægèle, Baudelocque, and others have been subjected to, they constrain us to believe that both a partial and complete rupture of the umbilical cord may take place; in consequence of which an effusion of blood is made into the cavity of the amnion.

ARTICLE III.

DIAGNOSIS.

A. *External Discharge.*—The difficulties hitherto described, (see *Diagnosis of Abortion,*) as complicating the diagnosis of hemorrhage during the first six months of pregnancy, are scarcely ever met with at a more advanced period. In fact, it is so rare to find women regular as late as the last three months, that every discharge of blood from the vulva at that period may be considered as a symptom requiring immediate attention; for, at the most, we could only confound a very slight hemorrhage with a return of the menstrual discharge, and, in both cases, the precautions to be taken would be the same; or, at least, if indifferent in the one, they might prove very serviceable in the other.

When a hemorrhage does come on in the course of the last three months of gestation, or during labor, the question arises, what is the cause? But this question, though very important both as regards the prognosis and the treatment, is sometimes exceedingly difficult to answer. It has been shown that often, perhaps even, according to certain authors, the most frequently, it is owing to an insertion of the placenta either over the os uteri, or on some adjacent point; and most of them go further, and endeavor to point out the signs whereby this abnormal situation of the after-birth may be recognized.

The absence of any signs is a sufficient reason for supposing the hemorrhage to be due either to a simple detachment of the placenta or to rupture of some of the utero-placental vessels. To enable us to make out this diagnosis by the method of exclusion, we have next to give an account of the signs of abnormal insertion of the placenta.

HEMORRHAGE FROM ABNORMAL INSERTION OF THE PLACENTA.

The signs that announce the existence of this anomaly may be divided into the *rational* and the *sensible*. The first are derived from the mode of development of the accident, and its attendant circumstances; while the second are furnished by the touch.

When the flooding comes on at an advanced stage of the gestation, more particularly in a woman who has previously borne children, it is most generally possible to detect the presence of the placenta over the internal orifice by the touch. In this case, says Levret, there is sometimes difficulty in finding the neck, notwithstanding it be in a measure within reach of the finger; for a great quantity of coagula, a part of which is adherent, is ordinarily found in the vagina, and their detachment augments the hemorrhage; beyond all these, a soft, fleshy, and, as it were, a pulpy tumor is detected.[1] When the accoucheur examines this tumor with the extremity of his finger, it feels as if he were touching the head of a small cauliflower, and he recognizes there the anfractuosities peculiar to the external surface of the placenta; then, by searching out the circumference of the tumor, the uterine orifice, which surrounds it towards its superior part, is made out; but all attempts to pass the finger between the tumor and the orifice will prove unsuccessful without a resort to violence, and a detachment of the tumor at the point where the index is passed up; or if some one place should happen to be free, the same would not be true for the whole periphery of the cervix.

A somewhat voluminous coagulum, situated in the os uteri, might be mistaken for the after-birth; but, by a little attention, it will generally be found that the clot is much less resistant, more friable and movable than the placental mass, which latter can scarcely be changed in position, and whose parts are separated with much more difficulty. Sometimes, quite a thick layer of coagulated blood covers the external surface of the after-birth, and prevents the finger from reaching its proper tissue, though the clot can always be detached by a slight effort, and the intervals between the cotyledons be made out. Fungous or cancerous tumors of the cervix, syphilitic vegetations, polypi, and hydatid tumors, might be mistaken for the placenta inserted upon the neck; but a consideration of the antecedents of the patient, the general symptoms she has presented, and especially a minute and attentive examination, will, I think, enable us readily to avoid mistakes of this character.

---

[1] In general, this examination has to be made with the greatest possible care, because the separation of the clots often causes a return of the hemorrhage. Where the os uteri is not sufficiently dilated to permit the introduction of the finger without difficulty, it would be proper to wait until the discharge had continued long enough to produce its relaxation. Indeed, unless the flooding be profuse enough to render a premature labor inevitable, and unless there be an actual commencement of the labor, or the patient be very near her full term, all explorations of this kind should be suspended, and the general measures calculated to subdue the symptoms be employed instead.

As stated above, the flooding may be dependent on an improper insertion of the placenta, and the latter be so far removed from the internal orifice that the finger, introduced into the os uteri, can only detect the naked membranes; if the patient be examined during labor, the extremity of the index should be passed over all the parts adjacent to the orifice, when the margin of the after-birth will most generally be felt, or, at least, the membranes will be found thicker than common; or, still more likely, an epichorion that is softer, and of a triple or quadruple thickness, will be detected towards that side of the os uteri where the placenta is inserted.

In certain cases, the diagnosis may be further facilitated by an examination of the lower part of the uterine tumor, even where the cervix does not permit the introduction of a finger. Thus, for instance, in a woman, used in my course for the practice of the "touch," who had advanced to the fifth month of her gestation, I observed the following condition of things: All the superior part of the excavation was occupied by a thick, fleshy, and comparatively soft tumor, which was very nearly of the consistence of the uterine walls at the second or third month of gestation. Towards whatever part of the superior strait I carried the finger, it still encountered the same resistance, and I found it impossible to detect any portion of the fœtus, or to perform the ballottement. From this single fact I suspected an insertion of the placenta over the os uteri, but was unable to verify my diagnosis; though I have since ascertained that she was delivered, six weeks subsequently, after a moderate flooding.

M. Gendrin has made a similar observation; for he says that, in cases of implantation of the after-birth over the os uteri, the only unusual phenomenon that can be recognized is the absence of the ballottement.

When the hemorrhage takes place either in a woman with her first child, or at an early stage of the gestation, when, in a word, the cervix uteri is not sufficiently dilated to permit the introduction of a finger, we might still be enabled to determine the cause of the flooding by the following signs, namely:

1. A hemorrhage caused by insertion of the placenta over the internal orifice never occurs before the end of the sixth month; and, most frequently, not until the last four or six weeks of gestation. Besides, it is highly probable that the period at which the flooding comes on, is usually subordinate to the greater or less extent of the placenta corresponding to the neck; that, in cases of insertion, centre for centre, it is manifested much sooner than where only one of its margins is in apposition with the orifice. Nevertheless, there are numerous exceptions to this (as M. Nægèle considers it) nearly general rule; for, in a large number of the cases of central insertion, the hemorrhage is not developed prior to the commencement of labor.

2. It commences spontaneously, without an appreciable cause, and without any precursory phenomena; the woman being often suddenly aroused in the middle of the night by the escape of blood from the genital parts.

3. When manifested for the first time, it is generally inconsiderable in amount, and soon over; but, after having disappeared altogether, it returns, sometimes in the course of a few hours, at others, not for several days; but, at each reappearance, the discharge is a little more abundant, and lasts somewhat longer.

4. The cervix uteri (considering the period of gestation) is usually thicker, softer, and more spongy, because the placenta, by becoming fixed over this point, determines there a more considerable afflux of blood.

5. If the labor has commenced, and the membranes are still intact, the flooding constantly augments during the uterine contractions, and diminishes in the intervals. But the contrary is observed when the discharge is occasioned by a separation of the placenta attached to any other point; for then the womb, by contracting, obliterates the vessels, either by a retraction of its own proper tissue, or by the compression they are subjected to from the parts inclosed within its cavity; but, in the case under consideration, the contractions that effect the dilatation of the cervix, destroy the vascular adhesions which unite it to the placenta, more and more, and thus multiply the sources of hemorrhage. This sign is one of great value before the membranes are ruptured; but after the waters are discharged, the child's head presses on the orifice during the contraction, and prevents the blood from escaping.

6. When the insertion is complete or central, the bag of waters does not form as in an ordinary labor; for the insertion of the placenta over the neck closes its orifice, and prevents the lower segment of the ovum from engaging therein, and from being accessible to the finger. But when the placenta covers but a part of the orifice, the finger discovers a greater or less extent of membranes, one point only of the orifice being occupied with the edge of the placenta.

7. Lastly, according to Dewees, the blood has a brighter color at the onset of the hemorrhage than when it comes from the fundus, and coagula never come away, excepting when the discharge has lasted for some time, or is on the point of disappearing.

HEMORRHAGE FROM RUPTURE OF THE UMBILICAL CORD.

In the case I have reported, where the flooding was produced by a rupture of the umbilical vessels, itself caused by a separation of the chorion from the fœtal surface of the placenta, the symptoms were very similar to those which accompany a hemorrhage induced by insertion of the placenta over the os uteri. Thus, the discharge commenced towards the middle of pregnancy, was several times renewed at irregular intervals, and always in increasing abundance; and it was manifested anew at the onset of labor. The vaginal examination could alone determine the diagnosis, by enabling us to ascertain the absence of the placenta from the internal orifice.

Finally, in the case detailed by Benckiser, there was something like a cord that crossed the opening in the neck at an acute angle, and this was detected before the rupture of the membranes. This cord was devoid of pulsations, but it certainly would have exhibited them if, instead of a venous branch, it had been one of the ramifications of the umbilical arteries.

Should another case of the kind be met with, the presence of such a vascular trunk on the membranes ought to receive attention, and arouse a suspicion of the possibility of a hemorrhage from its rupture.

B. *Internal Discharge.*—The diagnosis of the internal hemorrhages becomes more easy as the gestation advances. The general phenomena that accompany all profuse discharges would first attract attention; while the unusual and rapid development of the abdomen, and occasionally its irregular form, would confirm the surmise. The hemorrhage can always be recognized whenever it is abundant enough to endanger the mother; though it must be acknowledged that a quantity of blood may be effused between the womb and the placenta, which may effect nearly an entire separation of the latter, or destroy the child, without giving rise to any other phenomena than a manifestation of labor. Internal hemorrhage is especially to be feared after the membranes are ruptured, because then the blood may escape in large amount into the cavity of the ovum, or press the membranes aside with the greatest facility. In this case, the danger will be indicated by the general symptoms, and the diagnosis confirmed if the uterus, which had contracted firmly after the discharge of the waters, is now found to have attained a size equal to or greater than its original volume.

A considerable enlargement of the belly is a sign of the first importance; but it must not be forgotten that this may be occasioned by an entirely different cause. Thus, for instance, a tympanitis of the abdomen or a dropsy of the amnion may give rise to it; however, the sonorousness in the former case, and the slowness of the development of the abdomen in the latter, conjoined with the absence of any general phenomena, will always prove sufficient to avoid an error. Again, the patient may be affected with a syncope during the labor that is wholly foreign to any discharge of blood; but then the size of the abdomen will not increase.

On the whole, therefore, the general phenomena that accompany all losses of blood, and a rapid enlargement of the belly, are the two characteristic signs of internal hemorrhage, whether it occurs in the latter stages of pregnancy or during the parturition.

Finally, internal hemorrhage during labor is frequently followed by weakening or even suspension of the pains. The abdomen sometimes becomes painful, (Levret,) and in some cases an obscure fluctuation can be detected, (Leroux.)

Nevertheless, M. Henning has observed that, under certain circumstances, the abdominal swelling may be altogether wanting, and yet the syncope be dependent on an internal discharge. Thus, he says, the patient is taken at first with violent uterine pains, that reappear at certain intervals, and each one of which is followed by a slight issue of blood from the vulva; then, at a moment when least expected, the symptoms of a most alarming syncope come on, though but little blood can be found upon the cloths, and the uterus is scarcely distended. But, by making a careful examination, the accoucheur will find, that although this organ may inclose but an inconsiderable coagulum, and although the blood does not escape freely to the exterior, yet it is because the vagina is distended by an enormous clot as large as a child's head. I deem it necessary, he adds, to insist on the presence of

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

dary separation becomes a fresh cause of vascular rupture, and, as a consequence, augments the chances of flooding. For even suppose the hemorrhage were arrested, whether spontaneously or under the influence of the measures employed, there does not the less remain a voluminous coagulum in the uterus, a veritable foreign body, whose presence will irritate its walls, will determine there a more considerable sanguineous fluxion, and will excite premature contractions, and thus become perhaps the cause of another discharge.

Lastly, during the parturition, the internal hemorrhage is less to be feared before than after the membranes are ruptured; because, in the former case, the womb, being already occupied by the amniotic liquid, will yield less readily to a new distention, and, consequently, will prevent a great effusion of blood. Besides this, the integrity of the membranes will admit of their artificial rupture, which, by the salutary retraction that follows it, is one of the most valuable resources of our art in these unfortunate cases; and of which, it is unnecessary to add, we are deprived when the waters escape prematurely.

But the dangers that threaten the woman while the hemorrhage lasts are not the only ones to be dreaded; for her constitution and health may be broken down for a long time by these grave accidents. The labor is generally tedious, the pains being short and distant, and inertia of the uterus a consequence of the general weakness. After delivery, when all hemorrhage has ceased, some women are so completely exhausted as to have frequent attacks of fainting. Whatever solid or fluid nourishment is taken into the stomach is rejected, and they often die a few hours or days after the termination of labor. Even when the patients have the good fortune to escape with their lives, they ordinarily suffer for a considerable period; they are tormented with constant pains in the head; their digestion is painful, their vision and hearing are defective;[1] and there are often wandering pains in the limbs, trembling, &c., &c. Most frequently the labor is lingering, the pains are short and distant, and inertia of the uterus results from this general weakness. Those females who have been afflicted with profuse hemorrhages are far more disposed than others, during the lying-in, to acute inflammations, and to peritonitis especially; which inflammations then advance more rapidly to a fatal termination, because the general condition of the patient does not permit an active resort to the antiphlogistic treatment.

The cephalalgia noticed by all observers, and which I have frequently had opportunities of verifying myself, only disappears after a very long time, and not until the reparation of the blood and the re-establishment of the strength have taken place. M. Baudelocque supposes that the pain is particularly apt to be seated in the hinder part of the head. Leroux attributes this affection to a diminution in the quantity of blood contained in the vessels of the brain, which occurs as an immediate consequence. I would rather explain it like Baudelocque, by the direct influence which the loss of blood must exercise over the nervous system.

---

[1] In a case reported by Ingleby, the patient became suddenly blind; for five days she could not distinguish anything at all, and her sight was not perfectly restored till six months afterwards.

The child's death does not necessarily result from the hemorrhage; for, when the latter is inconsiderable, the gestation continues its regular course. The loss of blood has even been carried to an extent calculated to inspire just fears for the mother's life, and yet without being followed by abortion.

But although the fœtus may have resisted the violence of the first accidents, it must not be supposed that it experiences no injurious effects therefrom. Though but a small portion of the placenta may have been separated, the fœtus is nevertheless deprived thereby of a portion of its means of respiration and of nutrition, and this deprivation, though partial, may eventually prevent its complete development, and even destroy it before the termination of pregnancy. Therefore, when born alive, it is often emaciated, and weaker than under ordinary circumstances; and this congenital debility, which is generally regarded by authors as a consequence of the anemic condition of the mother, should, in my opinion, be attributed to the partial separation of the placenta.

When the mother has had the good fortune to escape the danger that menaced her, and the pregnancy continues, how then is the hemorrhage arrested? The mode of termination varies somewhat, according to the cause that has determined the accident. Thus, when the flooding has been preceded by general plethora, or by uterine congestion, it may happen that the escape of blood removes this condition, and thus remedies the symptoms itself; and this must nearly always be the case where the discharge resulted from a sanguineous exhalation. But where there is a rupture of one of the utero-placental vessels, it is possible that the flow of blood, by relieving their distention, will permit these vessels to become flattened down and depressed, from the double pressure of the ovum and womb, and then the hemorrhage is arrested. Again, where the placenta has been detached from the womb to a moderate extent, the bleeding can only be checked by the formation of a coagulum, which creates an obstacle to the ulterior issue of the blood, by being placed between the uterus and the placenta; for, "while the blood is endeavoring to glide towards the os uteri," says M. Velpeau, "a more or less extensive portion of the placental mass becomes fully saturated with it: first one clot forms, then a second, then a third, and these several layers, of various thickness, soon become sufficiently numerous, provided the energy of the hemorrhagic affluxion becomes diminished, to exert such a degree of pressure as to retain the blood within its own vessels." All the vascular tubes corresponding to the point where this coagulum is formed, are thenceforth rendered useless to the utero-placental circulation, which can only be kept up through those that have not been lacerated.

The authors of the *Dictionnaire de Médecine* (art. Hemorragie Uterine) seem to admit, from a case reported by Noortwyk, that the detached portion of placenta may contract new adhesions with the uterine wall; but from what has just been said respecting the formation of the coagulum, which, by its presence, puts an end to the symptoms, it is impossible to admit that this re-attachment can take place without the intervention of a fibrinous clot, which evidently precludes the re-establishment of the circulatory relations. Besides, this matter is satisfactorily proved at the time of labor; for, by examining the uterine surface of the placenta, we can then detect one or more fibrinous laminæ of a variable size, and differing from each other in the degree of degeneration, according to the period at which the separation was effected; in addition to which, the portion of placenta that had been detached is often atrophied and deprived of juices; in a word, the corresponding placental cotyledons have withered away completely.

PROGNOSIS OF HEMORRHAGE CAUSED BY ABNORMAL INSERTION OF THE PLACENTA.

As regards the cause producing the hemorrhage, that variety which is dependent on an implantation of the placenta over the inferior segment is the gravest of all: to the mother, because it is renewed several times during the latter months of her gestation in a constantly increasing amount, and because, being always present during the labor, it usually requires the intervention of art; to the child, because such an intervention is not without danger to it, and the interruption of the utero-placental circulation, resulting from the detachment of the placenta, produces an asphyxia that oftentimes proves speedily fatal.[1] The following statistics, by Dr. Simpson, prove the danger of this complication, namely: of 399 women in whom this misplaced insertion of the placenta was observed, 134 perished.

When the placenta is inserted over the neck, centre for centre, the hemorrhage would evidently be much more profuse than in the cases in which it is in contact with the orifice by one part of its circumference only. We would add the remark of M. Duval, that as the ovum can then yield only with great difficulty, because of the strength of that part of the chorion which bears the umbilical vessels, the labor is greatly prolonged, the fruitless contractions weaken at last, and the hemorrhage is increased by inertia of the womb.

A singular circumstance sometimes takes place in cases of central insertion. The gradual dilatation of the cervix may effect the complete detachment of the placenta, which may, perhaps, be entirely expelled through the vulva several hours before the expulsion of the child. This accident, which, at first view, would seem likely to have the most disastrous consequences, is nevertheless proved by experience rarely to compromise the mother's life, though it is generally fatal to the child.[1]

---

[1] The fœtus then dies by asphyxia, and not by hemorrhage, as has been asserted, and again repeated in the recent work of M. Gendrin. For the fœtus can only lose its blood when the source of the hemorrhage is in a lesion of the umbilical vessels; while, in a case of simple detachment of the uterine surface of the placenta, the child dies only because the circulation is interrupted in the utero-placental vessels, and its respiration can no longer take place. (See *Functions of the Fœtus.*) The blood, being shut up in the umbilical vessels, cannot come any more into the usual mediate contact with the maternal blood, and the infant is then in the same condition as an adult deprived of respirable air, and like him must die asphyxiated. Besides, the autopsical examination in such cases exhibits the anatomo-pathological characters of asphyxia.

There are some rare cases reported, in which the child's head, being forcibly urged on by the powerful contractions of the womb, has perforated the placenta near the middle, and thus opened for itself a passage through the central opening. This occurred in Portal's twenty-ninth observation; and W. White reports that, in a case where the placenta appeared to be inserted over the os uteri, centre for centre, the patient suffered two or three very intense pains, during which the head perforated the after-birth and was delivered. The child was still-born, but the woman recovered.

In some rare cases it has happened that the head, under the influence of powerful contractions, perforated the centre of the placenta, and was expelled through the passage thus formed. Portal's twenty-ninth observation relates to a case of this kind; and W. White informs us that in an instance of apparently central insertion upon the neck, the woman had two or three very strong pains, during which the head perforated the placenta, and was expelled. The child was still-born, but the mother recovered. In an autopsy made by Dr. Ingleby of a woman who died of hemorrhage just as the child was about being born, he found the head in the vagina, having passed through a central perforation of the placenta.

---

[1] Chapman relates an instance in which the after-birth was thus expelled four hours in advance of the child; and Perfect furnishes a very similar case. (*Cases*, vol. ii. page 288.)

"I was once consulted," says Merriman, "by a very careful and judicious practitioner, respecting a woman, who, when I first saw her, was rapidly sinking under puerperal fever. In this case, the placenta was expelled many hours before the child was born, and no extraordinary means were used to expedite the delivery of the child; a physician-accoucheur, who was consulted on the occasion, having deemed it more prudent to leave the case to nature. The fatal event, however, would lead one to doubt whether it was wise, under such circumstances, to decline the interference of art." (*Synopsis*, page 126.)

Smellie has reported three cases of the same kind; Lamotte, three (*Obs.*, 321, 322, 323); Lee, three (*Med. Gaz.*, 1839); Ramsbotham, Sen., five (*Practical Obs.*, Case 153); Baudelocque and Barlow, each one; and Dr. Collins (*Practical Treatise*, page 91) narrates an instance in which the placenta was expelled about eighteen hours before the fœtus; the membranes were ruptured, and the waters escaped two weeks before the entrance of the patient into the hospital; from that time until the eve of her admission, the flooding had continued with more or less abundance. We satisfied ourselves, says he, that the placenta had been extracted the evening before by the midwife who attended her. This woman recovered perfectly, and left the hospital on the thirteenth day.

Cases of this kind are much more common than might be supposed; thus, Dr. Simpson has collected 141 authentic observations, and, in order the better to appreciate the effect of this premature separation, he has divided them into four categories. In the first, 47 in number, there were 41 still-born children, and 10 of whose condition nothing could be learned, but all the women except three recovered. In all, the hemorrhage diminished greatly, or ceased altogether, immediately after the expulsion of the placenta, although an interval of ten hours at the most, and of ten minutes at the least, had elapsed between the expulsion of the after-birth and the birth of the child. In the second are placed 24 cases. In all of these rather less than ten minutes intervened between the expulsion of the placenta and that of the fœtus; 9 of the children were still-born, 2 were putrefied, and 11 were alive; no information respecting the two others; all the mothers but three recovered. The third contains 29 observations, in which the expulsion of the child followed that of the after-birth immediately; 14 still-born, and 11 living children; no information respecting the others; all the mothers recovered, except one. Finally, in 10 cases, the time between the birth of the child and the delivery of the placenta was not noted. Only 3 mothers died, and 9 children survived.

Thus, according to these facts, the premature separation of the placenta, which does not appear to have had a very serious effect upon the mothers, is extremely dangerous to the child, since all the children of the first series died; half only of the second, and eleven of the third category, survived.

We shall refer to these figures hereafter, in order to appreciate the practical consequences which Dr. Simpson thinks himself able to deduce from them.

When the placenta is situated only in the vicinity of the neck, the hemorrhage may not appear during the labor, although it may have occurred several times in the latter stages of pregnancy; for, should the membranes rupture prematurely, and the head be presenting, it is possible that its engagement might compress the torn vessels sufficiently to prevent the discharge of blood[1]

ARTICLE V.

TREATMENT.

The management of uterine hemorrhage may be subdivided into the preventive and curative treatment. The prophylactic measures are as numerous as the predisposing causes, and they consist in preventing the action of those causes; hence, to furnish a detailed account of them, it would be necessary to enter into a series of repetitions. Besides, they are included in the hygienic and general therapeutic management of pregnancy, and, therefore, we need not dwell further upon them here. But if, notwithstanding all the preventive means employed, or if, from the influence of any unforeseen causes, a hemorrhage is developed, what course shall we adopt to subdue it? The frequency of this accident, and its great danger in many cases, have at all times claimed the attention of practitioners; and with a view of facilitating the study of the numerous measures that have been recommended, we shall divide them into the general and the special ones. The first being applicable in all cases, are nearly always the same; but the second vary according to whether the flooding takes place in the course of the gestation or during parturition, and according to the abundance or the trifling character of the discharge.

[The measures taken to arrest hemorrhage ought not to be used indiscriminately, because each has a special mode of action which should be well understood before having recourse to it. Thus, bleeding and general remedies such as acidulated drinks, absolute rest and reduction of temperature, are intended to lessen the activity of the general circulation and, as sedatives, are useful in uterine as well as other forms of hemorrhage. Cold applications to the hypogastrium and thighs, cold injections and raising the breech by a cushion are, on the contrary, addressed directly to the uterine circulation which they are capable of reducing. Ergot, which has an excellent effect, may be used with a double purpose: some authors believing that it acts as a true specific, in virtue of a power of altering the character of the blood or of exciting the contractility of the vessels, whilst others think that it arrests hemorrhage only by producing contraction of the uterus, the effect of which we know is to lessen the circulation in the organ. Rupture of the membranes, by giving issue to the amniotic fluid, causes the walls of the womb to contract, and in so doing constrict and lessen the calibre of the vessels which they contain, thus becomes a very valuable means of checking hemorrhage. We have already stated in regard to the treatment of abortion (see *Abortion*), that injections of laudanum are capable of arresting the contraction of the womb, and may therefore be very serviceable whenever the loss of blood is due to irregular contractions. Lastly, the tampon is a plug which arrests the discharge of the blood and allows the progressive formation of a clot which finally obliterates the torn vessels.

---

[1] When, says Plenck, the orifice is half covered by the adherent placenta, the case should be left to nature; for the head of the child pushes the presenting part of the placenta aside, compresses the blood-vessels, and thus prevents hemorrhage. This precept, though too absolute, at least proves that Plenck had made the same observation that we have just mentioned.

Each of the above-mentioned measures has its special application according to the object in view, and ought not, therefore, to be used without judgment. What has been said will, I think, be sufficient to indicate the course to be pursued, and simplify the account of the details of treatment which we are anxious to present in the fullest manner.]

§ 1. General Therapeutic Measures.

Whenever an accoucheur is summoned to a pregnant woman who is affected with flooding, he should immediately attend to certain precautions that we are about to point out, namely:

The woman ought to be kept in a horizontal position, care being taken to have the pelvis elevated somewhat higher than the rest of the body. All feather beds must be proscribed, and, whenever possible, she should lie on a hair mattress that is rather hard. The bed is to be placed in a large, well-ventilated chamber, so as to be easily accessible on all sides; in the summer season, the room might even be sprinkled; and the woman is to be lightly covered. It is desirable to have the chamber somewhat darkened, and the attendants should be advised to discharge their respective duties without making any unnecessary noise. He should endeavor to satisfy the patient as to her condition, and to remove all sources of vexation and opposition; for calmness of mind is not less essential than rest of the body; especially, when the discharge has been occasioned by violent passions or acute moral affections.

Cold drinks, slightly acidulated with vinegar, gooseberry, or lemon syrup, or even with lime or orange juice, are the most suitable. We should endeavor to obviate the strainings the patient might make on the close stool, because they might possibly increase the flooding; for this purpose, the bowels are to be kept free by injections, or, if these are not sufficient to remedy the constipation, by mild laxatives; and, lastly, if the woman has the least difficulty in urinating, it would likewise be necessary to empty the bladder by the catheter.

§ 2. Special Therapeutic Measures.

These vary, as stated, according to the abundance or trifling character of the discharge, and according to whether the latter is manifested in the course of the gestation, or during the labor. We shall first examine them during pregnancy.

A. *Moderate Hemorrhage, occurring in the last three months.*—If the flooding has been preceded by the general phenomena of plethora, and if at the time when the woman is examined the pulse be found full, strong, and developed, the face flushed, &c., in a word, if the hemorrhage appears to be owing to, or kept up by, the plentitude or morbid action of the vessels, it is necessary to have recourse to general venesection, which will act both as a revulsive and as an antiphlogistic; but this measure is recommended in those cases only in which labor has not yet commenced, and where the discharge is inconsiderable, and has lasted but a short time. Blood-letting must be proscribed under the opposite circumstances, as also in those instances where the flooding is not associated with plethora.

When the hemorrhage is not very abundant, and, as a consequence, when there is some reason to hope that the pregnancy will continue on its regular course, opiates may be administered; they might be given by the mouth, but it is much better, in general, to exhibit them by injection, in the dose of twenty drops of Sydenham's laudanum, diffused in a small quantity of some mucilaginous vehicle; and this may be repeated three or four times, at intervals of an hour or more, where the first have not been sufficient to arrest the symptoms. A long experience, says Burns, enables me to recommend this measure in all cases where blood-letting is not practicable. For the first twenty-four hours, the patient must be subjected to a strict regimen.

Such are the measures to be employed in cases of moderate hemorrhage occurring in the last three months of gestation; and they should be continued until it has entirely disappeared.

After the symptoms are wholly subdued, the woman ought to take the greatest precautions to avoid a relapse, by keeping in bed for a week at least, eating but little, and that of non-succulent articles, especially if the discharge had been attributed to plethora, &c., &c.

B. *Profuse Hemorrhage occurring in the last three months.*—Where the flooding is more abundant, the remedies to be employed are also more active, and, to the measures already enumerated, except venesection, which, as before stated, must be rejected when the discharge is very profuse, we may now add:

1. The application of compresses, steeped in some very cold liquid, to the upper part of the thighs, hypogastrium, or loins (in one instance, M. Gendrin successfully administered an opiate injection at the temperature of melting ice); and, where the heat is very great, cold sponging over the legs, arms, and even the body. But the action of cold is not to be resorted to without discrimination; nor, as a general rule, should it be kept up for a long time; because, although its application may be useful at the commencement of the attack, when the phenomena of local congestion are manifest, it would certainly prove injurious if a very copious and persistent flooding had already enfeebled the patient, and if there was reason to fear the powers of life were giving way, and that the woman was likely to sink into a state of complete prostration.

When the skin is cold and the pulse small and feeble, the refrigerants are not indicated, and they should be suspended at once, if already in use.

2. In this latter case, if the flooding continued and the prostration augmented, it would be necessary to have recourse to revulsives applied to the superior parts. I have seen, says M. Baudelocque, a profuse hemorrhage suspended almost instantaneously by placing the hands in very hot water.

Under the title of revulsives it has been recommended, since the days of Hippocrates, to apply cups either above or just under the breasts, and between the shoulders.

M. Velpeau advises the employment of a sinapism at the upper part of the back; for he has found this remedy beneficial in a great number of instances, and at all stages of gestation; "nevertheless," he says himself, "there would be little wisdom in relying upon it to completely suppress a hemorrhage that had already become serious and alarming." It is, however, an auxiliary measure that should never be neglected, for it can have no disastrous tendency; but, in my opinion, the same cannot be said of revulsives applied to the breasts, since it is by no means certain that they may not prove injurious. Indeed, many authors, relying on the sympathy existing between the uterus and the mammæ, have supposed that every stimulant applied to the latter must excite the action of the former, and, consequently, tend to renew, or to keep up, the hemorrhage.

3. If the measures hitherto enumerated be not sufficient to arrest the flooding, the ergot might be exhibited in the dose of half a drachm divided into three parts, one of which is to be taken every ten minutes. This medicine, which is recommended by M. P. Dubois under such circumstances, appears to him to have nothing more than a hemostatic action; "for, if it be objected," says he, "that this remedy might excite uterine contractions, and thus provoke a premature labor, we answer that, up to the present time, not a single well-founded observation proves that the spurred rye has the property of *provoking* the uterine contractions; though, where these exist already, it increases them, or restores them when suspended; but it does not cause them to appear if the uterus is in a state of perfect rest. On the other hand, even supposing that it had this virtue, that would not be a just ground of exclusion, for it must not be forgotten that the question is before us of arresting a serious accident, one which cannot continue without prejudice to both mother and child; and that the only other resource is the use of the tampon, which even more than the ergot would expose her to the hazard of a delivery before term." (*Journ. de Méd. et de Chir. Pratique*, 1836.)

4. But it sometimes happens that, notwithstanding the employment of refrigerants and ergot, the flooding continues, the woman becomes pale and colorless, the pulse small and thread-like, and she has vertigo, &c.; and the violence of the symptoms endangers the lives of both mother and child. Under these grave conditions, the accoucheur has only to choose between an application of the tampon and a provocation of the labor by rupturing the membranes.

A. *Use of the Tampon.*—When speaking of the natural termination of those hemorrhages that come on during pregnancy, we stated that the discharge was arrested in consequence of the formation of coagula, which, by becoming applied over the orifices of the vessels, perhaps even by being continued into these orifices, prevented a subsequent discharge of blood; and that it is on the formation of these salutary coagula that we must found our hope, so long as there is a chance of preserving the infant. It was with this view that the older physicians resorted to the use of astringent injections, and more especially to pessaries made of some old linen saturated with such liquids. But they did not depend upon the coagulating and astringent properties of these substances alone; but also relied on their mechanical effect in retaining the blood. For this purpose, therefore, Leroux, of Dijon, proposed his tampon in 1776. This remedy, says he, is exceedingly simple; it consists in the creation of an obstacle to the escape of the blood by filling up the vagina with balls of linen or tow, saturated with pure vinegar. Desormeaux thought it was better to first double a large piece of fine linen, and then carry up the fold to the fundus of the vagina; and afterwards to fill the pocket thus formed by the linen with bits of charpie, or tow, or any other soft substance that may be at hand. M. Moreau condemns this procedure, because, he remarks, it is difficult and painful, and it would be almost impossible not to leave some space between the tampon and the cervix uteri. He recommends the mode of application to be altered to suit the particular case: for instance, if the os uteri is a little dilated, he advises the use of a roller, wound tightly in the form of a cone, and well fastened; then the conical extremity of this plug is introduced into the uterine orifice itself, and is retained there by the finger. When the dilatation is somewhat more advanced, he makes use of a lemon, having the rind pared off at one extremity, and he introduces this into the neck of the womb, where its bulk obliterates the orifice, and its juice irritates the organ; and lastly, when the os uteri is freely dilated, he recommends the vagina to be crammed with lint steeped in vinegar, and the whole to be secured with a T bandage. Leroux was also in the habit of saturating the tampon with vinegar. The astringents were considered useless by Desormeaux; for, he says, it is only on the mechanical action of the tampon that we can rely, and not upon the irritation which its contact, and that of the acids with which some persons saturate it, may have on the uterine wall. It would be very fortunate, indeed, if the only effect of the tampon was to prevent the issue of the blood, and to determine its coagulation; for then, by arresting the hemorrhage, we might preserve the life of the fœtus much oftener than is now done. But, unhappily, it has yet another effect; that is, it frequently irritates the organ by mere presence, and by forcing the blood to coagulate in the uterine cavity, whereby a more or less voluminous coagulum is formed there, which further adds to the irritation produced by the tampon itself; contractions are excited, and, in most cases, the womb soon drives out the tampon, coagulated blood, and fœtus altogether. This, we may observe in passing, is the most serious objection that can be urged against the use of the tampon, a reproach that it often merits, especially when it is saturated with vinegar.

But, after all, notwithstanding these disadvantages, the tampon is a remedy that cannot be dispensed with in practice; and we do not know how to better describe the cases in which it may be resorted to with advantage, than by furnishing the following extract from the memoir published by Gardien, in the ninth volume of Leroux, Boyer, and Corvisart's Journal.

The tampon may be applied: 1. To arrest any hemorrhage that might arise from the rupture of a varix on the uterine neck, or in the vagina. 2. In a case of laceration, occurring at the orifice of the womb during labor, and when there is any inertia, by a direct application to the torn surface. 3. In cases where the placenta is inserted over the os uteri centre for centre; the blood being retained by the tampon, forms a coagulum which is compressed between it and the after-birth, whereby the serous part is expressed, and a concretion takes place which contracts adhesions with the adjacent parts, and suspends the discharge until the rupture of some other vessel renews the hemorrhage. Nothing is to be feared in these cases from an internal bleeding; for, although we have quoted some examples of the kind, these are so rare that they cannot counterbalance all the advantages of the tampon; besides, the mere fact of its employment does not dispense with the necessity of carefully watching the patient. 4. It is likewise serviceable in the floodings attending the abortions which take place in the course of the first three months, whether before or after the delivery of the after-birth: before, because Puzos' method might render this delivery impossible, or at least very difficult; and after, because there would be no cause to fear an internal hemorrhage, for the reasons before given. 5. It might answer in those instances where there is no dilatation of the os uteri, or when this is impossible, and consequently where it would be impracticable to pierce the membranes. 6. And lastly, where the flooding continues after the membranes have been punctured, and it is impossible to effect a forced delivery; as in the cases reported by Lamotte and Smellie. Nevertheless, its employment then should always be watched over with the greatest possible attention; for the uterus, in which a void is created after the discharge of the waters, is susceptible of becoming distended, and an internal hemorrhage might take place. Under such circumstances, artificial delivery must be resorted to.

But the tampon should be rejected: 1. Whenever we might reasonably hope to prevent an abortion; for even Leroux himself made use of the ordinary means before resorting to this measure; because, by retaining within the womb the blood that would otherwise escape, it distends this organ by forming a coagulum, which may increase the detachment of the membranes and placenta, and may likewise irritate the womb by its presence, and thus bring on the contractions; and 2. Whenever (as hitherto stated) the placenta is inserted over the os uteri, and the labor is sufficiently advanced for turning or the forceps to be resorted to.

B. *Rupture of the Membranes.*—When the hemorrhage is profuse, and has made its appearance during the latter months of gestation, more especially if the labor has already begun, a rupture of the membranes should generally be preferred to the use of the tampon. The child's life is then almost as precious as the mother's, and we must endeavor to remove it from the threatened danger. It was with this view that our predecessors resorted to an artificial labor under such circumstances. But Puzos has proposed a measure which conjoins the advantages of the natural with those of a forced delivery. It is necessary for this purpose, he says, to introduce one or more fingers into the uterine orifice, by which an attempt is made to dilate it with a degree of force proportioned to its resistance; this gradual dilatation, which is interrupted by intervals of rest from time to time, excites the pains: the womb contracts, and during its contraction the membranes become tense, and engage a little at the upper part of the cervix, and these latter are ruptured as soon as possible, in order to effect a discharge of the waters. The presenting part, particularly if this happens to be the head, should be carefully pressed up by the finger for some moments, so as to permit the liquid to escape. The objects to be accomplished are obviously to encourage a discharge of the waters, to arouse the contractility of the uterine tissue by their evacuation, and to solicit its retraction; whereby the vessels situated in the thickness of its walls would undergo certain modifications favorable to an arrest of the hemorrhage. Further, when the womb is well contracted on the body of the child, and some portions of the latter are forcibly applied against the patulous vessels that furnish the blood, the compression thereby produced must evidently arrest the flooding.

This method, which has been adopted by Dr. Rigby, of England, has been severely criticised by his countryman, Duncan Steward, who endeavors to support his own opinion by the following observations: by rupturing the membranes before the uterus is dilated, we retard rather than accelerate the expulsion of the child; and, besides, it is by no means certain, as experience has demonstrated, that this measure will arrest the hemorrhage; while it often diminishes the chance of saving the life of the mother and child, by rendering the version much more difficult, if this operation should subsequently become necessary.

Notwithstanding these objections, which, after all, have no great force, the rupture of the membranes is advocated by most of the teachers of the present day, in cases of profuse flooding, occurring at an advanced stage of gestation. Nearly all teach, however, that a regular commencement of labor, manifested by evident uterine contractions, should precede its performance; but, as M. P. Dubois remarks, it is important to bear in mind that, when a considerable hemorrhage takes place, the contractions of the womb are often feeble, and that the labor may actually be progressing, though the pains have not clearly marked its onset; while, on the other hand, the discharge of a large quantity of blood and the escape of voluminous coagula, both relax and dilate the uterine orifice; and these circumstances, which are doubtless joined to some non-painful contractions, may dilate the os uteri, without the knowledge of the patient or the suspicion of the accoucheur. This phenomenon is not at all unusual, especially in women who have previously borne children; and, therefore, whatever be the condition of the body of the uterus, and whether there be any apparent contractions or not, he should carefully ascertain the state of the os uteri. In cases of profuse flooding, this will most frequently be found sufficiently dilated to permit the introduction of a finger, at least; and the membranes will then be felt tense and protruding at intervals; which protrusion is a certain proof that the womb begins to contract, and the rupture of the membranes will then be effected to the greatest advantage. Besides, this operation does not exclude the employment of the various stimulants calculated to excite the contractions; thus abdominal frictions might be resorted to, and the finger, when introduced into the neck, should first titillate and irritate this part before making the rupture; and it would even be prudent to administer two or three doses of ergot to the patient, provided the neck is softened, and it seems to offer no marked resistance to the dilatation.

Most accoucheurs advise the application of the tampon, when the discharge is produced by an insertion of the placenta over the cervix; but M. P. Dubois teaches that the course to be pursued in such cases will vary according to the degree of this insertion. For instance, where it takes place centre for centre, or in other words, when the placenta covers all the superior part of the internal orifice, and the membranes are inaccessible, or can only be reached by detaching some portion of the circumference of the still adherent placenta, we should have recourse to the tampon; but where the placenta corresponds to the orifice by only one of its borders, and particularly where it is inserted at some point adjacent to this orifice, he likewise recommends an artificial rupture of the membranes; being satisfied that, after the waters have escaped, the child's head, by becoming applied on the detached portion of the placenta, will, by compressing it, put an end to the flow of blood.

Quite recently, M. Gendrin has entertained the idea of adopting Puzos' method, even in those cases in which the after-birth corresponds to the os uteri centre for centre. Under almost identical circumstances, Rigby had deemed it advisable to push his finger through the centre of the placenta, and thus pass directly into the amniotic cavity. The following are the observations of M. Gendrin on this subject: Authors, he says, have advised that labor should be induced by direct manipulations, which consist in forcing the dilatation of the os uteri and passing into the womb through the placenta, or by detaching this organ from one portion of the neck; but these manœuvres occupy much time, and besides are very difficult, and if the blood continues to flow, the enfeebled patient may become prostrated. We propose instead the following process, which has the great advantage of keeping up the relation between the after-birth and the uterus, as long as possible. It consists in evacuating the waters, by making a puncture with a female catheter, which is directed along the finger previously introduced into the os uteri, and is passed into the membranes through that portion of the placenta lying over the neck. In the two cases in which he adopted this plan, the hemorrhage disappeared immediately; and this measure may, therefore, be employed, when the amount of the discharge indicates a resort to the method of Puzos, and when the presence of the placenta is the only obstacle.

We think, however, that if the dilatation is but slight, the tampon had better be applied.

Internal Hemorrhage.—We can only expect to overcome those internal discharges that are serious enough to compromise the mother's life, by emptying the womb and terminating the labor. Two different conditions may then be met with, viz., one, in which the labor has not yet commenced, the neck is still undilated, and its margins hard and thick; in the other, on the contrary, there are some labor-pains, the cervix is softened, and is more or less dilated. In the latter case, the indications for treatment are obvious; that is, to rupture the membranes and employ all the various measures which are calculated to hasten the contractions (such as abdominal frictions, titillations of the orifice, and ergot), and to watch the state of the womb after this rupture attentively. Such is the course to be pursued when the dilatation is inconsiderable; but, on the other hand, when the os uteri is either dilated or dilatable, the delivery should be effected at once by turning, or by an application of the forceps, according to circumstances. (See *Version*, and art. *Forceps.*) But where the symptoms occur a short time before the full term of gestation, particularly in a woman with her first child, the complete obliteration of the cervix may constitute an insurmountable obstacle to the introduction of the smallest instrument. In these grave cases, after having employed the usual means to moderate the effusion of blood without benefit, such as irritations made on the neck and over the fundus of the womb, with a view of bringing on its contractions, it will be absolutely necessary to perforate the membranes, and if the hemorrhage continues, and the woman becomes weaker and weaker, and is threatened with death, to have recourse to a forced introduction of the hand. Generally speaking, the slightest efforts will be sufficient to overcome the resistance; since it is scarcely possible for a considerable effusion of blood to take place in the cavity of the uterus, without causing a development of some pains, or at least a marked diminution in the resistance of the cervix. But if it should unfortunately happen that this resistance cannot be surmounted, I think that multiple incisions ought to be made on the neck itself. If the symptoms were not very urgent, it would be better perhaps to have recourse to compression of the abdomen, which would prevent the womb from becoming inordinately distended. This procedure has so often appeared successful, that its employment under like circumstances would be justifiable.

C. *Moderate Hemorrhage during Labor.*—When the flooding occurs during labor, the indications it presents likewise vary according to the intensity of the symptoms and the degree of dilatation of the os uteri. When the blood escapes in small quantities, and the accoucheur is satisfied that it does not accumulate within the organ, he will employ here the same means as were recommended for the slight hemorrhages occurring in the latter stages of gestation; except the blood-letting, which should only be practised when evident phenomena of plethora exist, and also excepting the opium, which would here be attended with the serious inconvenience of suspending the uterine contractions. These general measures will usually prove sufficient when the neck is but little dilated, and the discharge is inconsiderable.

But should the cervix be freely opened, or be so softened as to offer no resistance, we should rupture the membranes, if they are yet intact; and if the flooding still continued after this rupture, the labor lingered, and the pains though at first energetic, became gradually feeble, and the intervals between them longer, they should be aroused by the administration of ergot.

D. *Profuse Hemorrhage during Labor.*—Whether the hemorrhage be internal or external at the time of labor, it always offers the same indications for treatment; and these latter are also based on the variable degree of dilatation of the neck of the uterus. For, if this is but little advanced, that is, if the cervix be neither dilated nor dilatable, the remedies we have advised for the profuse hemorrhages occurring in the latter months of pregnancy should again be brought into service; that is, the refrigerants, the ergot, and a rupture of the membranes, if still intact. Should the flooding continue after the rupture, and the retraction of the os uteri render an introduction of the hand absolutely impossible, the tampon should be applied at once; and the precaution be taken to make compression over the anterior surface of the abdomen, particularly if there is any inertia of the womb, so as to prevent an accumulation of blood within the organ. And where the flooding persists, notwithstanding these measures, so as to endanger seriously the mother's life, and if at the same time the non-dilated and undilatable neck should make it impossible to introduce the hand, ought we, according to the example of certain authors, effect delivery at all hazards, and introduce the hand by force? Upon contemplating the published cases of this kind, we are forcibly struck with the results of this style of proceeding. Almost all the patients died (21 out of 25 according to statistics by Simpson), and authors universally regard the operation as of the gravest character. We therefore think it prudent not to risk the injuries of the neck, which result so often from a forcible introduction of the hand, but if, after a few moderate efforts, the rigidity is not overcome, we would much prefer, if the case were urgent, to resort to Simpson's method, and first detach and then extract the placenta. Whilst the author of this process has certainly advised it too generally, it seems to us that it could be usefully employed in these circumstances, although, for our own part, we would prefer the use of the tampon.

Professor Simpson has, in consequence of these facts, proposed to separate completely, and bring away the placenta, whenever its insertion upon the neck has given rise to a hemorrhage which threatens the life of the mother. Although rather too absolute at the outset, Mr. Simpson has finally yielded to the numerous and valid objections made to his precept, so far as to confine its application to the following conditions: 1. When the flooding has resisted the principal measures, and especially the evacuation of the waters; 2. When the slight dilatation or development of the cervix, or contraction of the pelvis, render turning or any mode of artificial delivery dangerous or impossible; 3. When the death or immaturity of the fœtus restricts the duty of the accoucheur to caring for the safety of the mother. It is, therefore, especially with primiparous females, in cases of premature labor, or rigidity of the cervix and of its spasmodic contraction, of organic narrowing of the pelvis or of the genital passages, of the death or non-viability of the fœtus, and, finally, of extreme exhaustion of the mother, that the artificial separation may be practised. It is to be understood, he adds, that in cases of separation or of extraction of the placenta, the fœtus should be withdrawn immediately, unless the hemorrhage should cease, which it does in the great majority of cases.

Even with this reservation, we cannot approve of the advice of Mr. Simpson; for we think that when the flooding continues after the evacuation of the waters, and when the neck does not allow the hand to be introduced, there is some chance left of saving both mother and child by applying the tampon, being careful at the same time to compress the abdomen, in order to prevent the occurrence of internal hemorrhage.

We also think, that when an obstacle dependent on the neck, the soft parts, or the pelvis, prevents the termination of the labor, the tampon may be applied with advantage until the dilatation of the neck allows of the intervention of art; for I cannot see in what way, under these circumstances, the extraction of the placenta could facilitate that of the fœtus, which Mr. Simpson recommends to be practised immediately afterward. The obstacles which prevented earlier action exist none the less afterward. It is, therefore, only when caring very little for the life of the child, in case of the death or non-viability of the latter, that one could undertake to separate and extract the placenta, if the hemorrhage were dangerous, in order to spare the mother the pain of applying the tampon.

Finally, it is hardly necessary to add, that if the neck is sufficiently dilated, the delivery should be effected as soon as possible, either by turning or by the forceps. When describing these two operations, we shall point out carefully the cases in which one or the other should be preferred.

A host of other remedies have been successively extolled, but I have not spoken of them, because I have never had an opportunity of employing nor of seeing them employed; besides, their mode of action appears, on theoretical grounds, to be of little value; and hence, in my opinion, their enumeration would uselessly burden the memory of students.

[§ 3. TREATMENT OF HEMORRHAGE CAUSED BY ABNORMAL INSERTION OF THE PLACENTA.

Having described in the foregoing paragraph the treatment adapted to hemorrhage caused by insertion of the placenta upon the orifice of the womb, the reader is referred to the account therein contained of the various hemostatic procedures applicable to such cases, as we have nothing to add to what will be found there stated. (See page 775, *et seq.*) Still, the importance of the subject and the danger involved in this form of hemorrhage, makes it proper to recapitulate briefly the best conduct to be observed.

Hemorrhage caused by abnormal insertion of the placenta is generally moderate at the outset; with each return, however, it becomes more profuse, the patient grows weaker, and consequently in a more unfavorable condition for supporting the inevitable loss of blood which will accompany delivery. Therefore we do not advise a very long-continued expectant treatment, and have no hesitation in recommending the tampon in order to arrest the recurrent hemorrhages, without waiting for the commencement of labor. What, indeed, are the grounds of complaint against the tampon? Is it that it is likely to induce labor? But when the placenta is inserted upon the mouth of the womb, the tampon is still the best means of arresting the hemorrhage under the circumstances. It ought, therefore, to be applied early, even should it be uncomfortable. At proper intervals, though as rarely as possible, it ought to be removed in order to allow the patient to urinate and permit the accoucheur to watch the progress of the labor, which usually commences before long. Then it should be reapplied until the dilatation is sufficient to allow delivery to be accomplished by turning. If labor does not come on soon, and the tampon give great annoyance, its application might be postponed until a fresh hemorrhage appears. Under the last supposition, plugging the vagina would be useless, though not injurious; therefore it should be had recourse to at the first recurrence of the discharge.

Next to the tampon, rupture of the membranes seems to be the most useful. But in order to do it with safety, there should be decided contraction of the uterus, the head should present, and the insertion of the placenta ought not to be central. If, notwithstanding the conjunction of all these favorable circumstances, the flow should continue after the membranes are ruptured, the operation would have the inconvenience of rendering internal hemorrhage possible through an effusion of blood into the cavity of the ovum. When the placenta is merely situated in the vicinity of the cervix and labor be clearly begun, rupture of the membranes is almost always productive of excellent results; still, should the state of affairs be serious, we would prefer to use the tampon.

We regard the application of the tampon as the heroic measure against hemorrhage from insertion of the placenta upon the mouth of the womb or near it, and rupture of the membranes as coming the next in order. The other procedures, detachment of the placenta included, we have less confidence in, and refer to what we have said of them in the preceding pages. (See *Treatment of Hemorrhage*, page 775, *et seq.*)]

§ 4. Recapitulation of Treatment.

I do not know better how to conclude my remarks concerning the hemorrhages that may affect females, in the course of the latter months of pregnancy, and during labor, than by placing before the reader a short summary of their treatment which M. P. Dubois caused to be distributed among the students that attended his clinique; for, as the Professor states, this table may be considered as a kind of *vade-mecum*. Besides, the reader will see by it how far I have conformed to his ideas, in the treatment of hemorrhages just given.

[After a very profuse hemorrhage has been arrested, the patient will be so weakened that she cannot be regarded as out of danger. Women sometimes succumb several hours after the discharge of blood has ceased, with symptoms which will be described hereafter in connection with the account of hemorrhage attendant upon delivery of the placenta, as also the treatment proper in such cases. (See *Accidents attending Delivery of the Placenta*.)]

This book is the property of
COOPER MEDICAL COLLEGE,
SAN FRANCISCO, CAL.
and is not to be removed from the Library Room by any person or under any pretext whatever.

A SYNOPTICAL TABLE

Showing the Treatment of External Hemorrhages before and during Labor.

BEFORE LABOR.	A. Moderate Hemorrhage.			Horizontal position. Absolute rest. Fresh air. Cool acidulated drinks. Restricted diet. Venesection, if there are any symptoms of plethora. Empty the bladder and rectum.
	B. Profuse Hemorrhage.			Same measures as in A, excepting venesection. At first cold applications — then, Ergot ʒss divided into three doses, at intervals of ten minutes. And, if these are insufficient, to apply the tampon, or perforate the membranes.
DURING LABOR.	Moderate Hemorrhage.	Orifice not dilated and undilatable.	Membranes entire.	Same measures as in A, excepting venesection, which is improper, unless the plethoric condition be well marked.
			Membranes ruptured.	*Idem* *Id.* *Id.* *Id.*
		Orifice dilated.	Membranes entire.	Same measures as in A, then wait, or rupture the membranes.
			Membranes ruptured.	*Id.* *Id.*, then wait; if the pains are slow and feeble, administer ergot.
	Profuse Hemorrhage.	Orifice not dilated and undilatable.	Membranes entire.	*Id.* *Id.*, except venesection, then refrigerants; and in case of inefficiency, and the pains are weak, ergot, then rupture the membranes; lastly, if the orifice should not permit version, apply the tampon.
			Membranes ruptured.	Same measures as in A, then refrigerants; then ergot, if the pains are slow and feeble; in case of inefficiency, compression of the uterus, tampon, forced delivery.
		Orifice dilated or dilatable.	Membranes entire.	Rupture the membranes; if this is not sufficient, make version, or apply the forceps.
			Membranes ruptured.	Version, if the head is above the orifice; forceps, if it is in the excavation; simple extraction, if the pelvic extremity present.

CHAPTER XII.

OF ECLAMPSIA.

AMONG the various convulsive diseases that may appear during pregnancy, parturition, or the lying-in, there is one which has such well-marked characteristics, and whose physiognomy is so peculiar, that I can scarcely comprehend the want of accuracy that still exists in most of our classic works on this subject. This confusion evidently arises from the fact that the authors who have written on puerperal convulsions have included under this title all the affections whose striking character is a convulsion; forgetting that the epithet *puerperal* should be applied, not to every disease which is developed before, during, or after labor, for then we might admit a puerperal pneumonia or pleurisy, but simply to one that is intimately associated with that state, and which is only produced during its continuance. This confusion is further caused, in my opinion, by designating as convulsions some affections that do not merit the name.

These two propositions will be easily sustained by an *exposé* of the distinctions admitted by some authors. According to them, the convulsions that occur during gestation may be either partial or general. Under the name of partial convulsions, they have described those affections whose principal character is a rapid, abnormal, and involuntary contraction of one or more muscular organs, and which, consequently, are convulsive; but which are otherwise so different from what has usually been comprised under the denomination of the convulsions of pregnant women, that it is with some hesitation, and only to avoid the reproach of having omitted any important facts, that I allude to them here. Thus, to give an example, those violent contractions of the stomach, observed in certain women who are affected with severe and obstinate vomitings during gestation, as also the palpitations of the heart experienced by some others, have been classed among the puerperal convulsions.

M. P. Dubois relates having seen the walls of the belly contract with such force, in a woman in the fifth or sixth month of her pregnancy, that the uterus was completely pressed back into the excavation; and the organ was afterward observed to return briskly to its place, and to rebound like an elastic ball when thrown on the ground. Some other tumefactions appeared in the flanks, in the epigastrium, and umbilical region, which seemed to depend as much on the spasmodic contraction of the viscera as on that of the walls of the abdomen. Nevertheless, this woman recovered without aborting.

M. Velpeau states, in his excellent thesis, from which I extract the foregoing case, that a countrywoman, aged twenty-two years, was much alarmed on the *tenth day* after her delivery by movements that took place in her belly; something like a globe was observed through the integuments and muscles, which would travel sometimes towards the excavation, at others towards the flanks, and again in the direction of the umbilicus. This species of ball would transform itself at times into several lumps, which traversed the abdomen with a rumbling noise; but the walls of this cavity always seemed to preserve their normal suppleness. This woman died insane two years afterwards, *without these singular movements ever having altogether disappeared.* Can such a case be referred, with truth, to puerperal convulsions?

According to certain accoucheurs, the vaginal parietes are occasionally so violently contracted, as to prevent the escape of the child, and even to benumb the hand of the attendant by their spasmodic action. But of all the partial convulsions, those of the uterus are the least questionable. We have already treated of the spasmodic contraction of the external and internal orifices of the neck, which are capable of retarding the labor greatly in ordinary cases, and, in breech presentations, may cause extension of the head, and thus render its extraction difficult; and we shall see, hereafter, (art. *Delivery of the Placenta,*) what influence this retraction of the orifices, which is evidently due to a convulsive contraction at the superior or inferior part of the cervix, as well as the partial one of some of the fibres in the body of the womb, may have over the delivery of the after-birth.

We shall only mention here, that other cases, similar to those detailed by M. Dubois, have been reported, in which the uterus has been observed to pass rapidly upwards, downwards, and towards the sides of the abdomen; and even to descend with such violence towards the vulva, that it was necessary to sustain the latter with the fingers to prevent it from escaping; but, for further particulars, we refer the reader to the essays of Baudelocque and Miquel.

The instances just referred to, doubtless resemble some of the features of the disease we are about to describe under the name of *eclampsia,* in being characterized by a rapid, abnormal, and involuntary contraction; but they differ from it so much, in the triple aspect of symptoms, prognosis, and treatment, that they cannot, in my opinion, be classed under the same denomination, without confounding things that are essentially dissimilar.

The question now recurs, what is the state of the case as regards the general convulsions of pregnant women? Hysteria, tetanus, catalepsia, and even apoplexy, have been observed during pregnancy and parturition, and have, on that account alone, been forthwith denominated as puerperal diseases; and although these affections offered the same symptoms as when they occur in the non-gravid state, though they were essentially different from eclampsia, properly so called, yet they were considered as mere varieties, or particular forms, of this latter complaint. True, there can be no doubt that hysteria, tetanus, etc., are modified by the peculiar condition of the pregnant female; and, as in all other diseases that occur during the puerperal period, the danger to which they expose the patient is increased by that to which they subject the fœtus; but the hysteria does not thereby become less an hysteria, and the tetanic convulsion has not the less its characteristic persistence. These are evidently, therefore, distinct affections.

I ought, however, to add, that the form of the convulsion may vary, and that an attack which at the outset presented all the characters of eclampsia, might finally assume the tetanic or even the cataleptic form. Supposing that no error of diagnosis has been committed, the latter are exceptional cases, in regard to which it is difficult to say whether the same disease has assumed two different physiognomies successively, or whether one disease, catalepsy, has succeeded to another, eclampsia. Dr. Schmidt, of Paderborn, and M. Danyau, have each published a case of this kind of transformation. (*Journ. de Chirurgie*, 1844.)

Apoplexy may occur in the puerperal state, either as the principal disease or as a termination or complication of eclampsia. Often, indeed, as stated below, the puerperal convulsions determine a cerebral effusion; but then it is an effect, and not a cause, of the accident. There are likewise some cases in which the general circulation, as an effect of the remarkable modifications it undergoes during pregnancy, is strongly determined towards the brain, and may even result in an effusion; and if so, the latter is sometimes preceded by slight convulsions, or a tetanic stiffness in one or more limbs; but these soon pass away and do not reappear. Here, then, the apoplexy is the disease; but it is nothing more.

In my opinion, therefore, it must be admitted that, during the gestation, the parturition, or the lying-in, women may have attacks of hysteria, of tetanus, or catalepsy, or may be struck with apoplexy; but these are so many distinct affections, having but one common symptom with eclampsia—the convulsion. We hope that the details, into which we are about to enter, will illustrate the numerous differences between them.

For myself, I understand by the term eclampsia an affection characterized by a series of fits, in which nearly all the muscles of relation, and often also those of the organic life, are contracted convulsively, and which fits are usually accompanied with or followed by a more or less complete suspension of the sensorial and intellectual faculties for a variable period.

General convulsions (eclampsia, properly so called) constitute a quite rare disease. M. Velpeau did not observe a single case in a thousand labors superintended by him at the Clinique. It is probable, however, that this proportion is too small; for, by consulting the statements furnished by Madame Lachapelle, Merriman, Ryan, Pacoud de Bourg, etc., it appears that there was one case of convulsion in about two hundred deliveries. On the other hand, the practice of the principal accoucheurs of Great Britain would furnish one case of eclampsia in four hundred and eighty-five labors, nearly.[1]

It is, however, almost impossible to ascertain an exact proportion by consulting the practice of any single man, since great variations are observed

[1] Bland,	in	1,897	women, met with		2 cases.
Joseph Clarke,	"	10,387	"	"	19 "
Merriman,	"	2,947	"	"	5 "
Granville,	"	640	"	"	1 case.
Cusack,	"	398	"	"	6 cases.
Maunsell,	"	848	"	"	4 "
Collins,	"	16,414	"	"	30 "
Beatty,	"	399	"	"	1 case.
Ashwell,	"	1,266	"	"	3 cases.
Mantell,	"	2,510	"	"	6 "
Churchill,	"	600	"	"	2 "
		38,306			79

Thus we have 79 cases of convulsions in 38,306 labors, or 1 in 485, nearly.

in different years; in my own experience, for example, I met with but three cases in two thousand deliveries occurring under my care at the Hôtel Dieu and the hospital of La Faculté, whilst house physician at those institutions, whilst, on the other hand, I met with seven cases within the months of July, August, September, and October, 1846, whilst in service at the Clinique.

Eclampsia appears indifferently at all seasons of the year; although some authors have seemed to consider, improperly, I think, that certain atmospherical conditions are not altogether foreign to its production, and that it occurs more frequently in some seasons than in others. Madame Lachapelle, who appears quite disposed to adopt this opinion, notwithstanding the summary she furnishes sustains her views but very imperfectly, relies upon the fact that at the hospital of La Maternité, several individuals are nearly always affected at the same time. But I am strongly disposed to believe this circumstance is rather owing to imitation than to the influences of the atmosphere.

This affection is very unusual in the early months of gestation: M. Danyau, Sen., however, met with it in a young girl, who had only reached the sixth week, and in whom nothing but the extraction of the ovum could remove the symptoms. The eclampsia came on again in her next pregnancy about the same period, and was followed by an abortion; but, in this instance, the fits continued for some time after the abortion.

A lady of Ferrara, about twenty-eight years of age, of a bilious temperament, and the mother of three children, was periodically attacked by convulsions as soon as she had conceived, and these attacks were renewed every two weeks throughout gestation; so that their appearance constituted in her a sign of pregnancy. It is very doubtful, however, whether her case was one of true eclampsia. As a general rule, they are quite rare prior to the sixth month; they are particularly frequent during parturition; and they appear somewhat oftener after the delivery than during the gravid state.

The period at which they are liable to occur after delivery varies greatly; though the eclampsia most commonly appears a few hours, or sometimes even a few days after delivery, examples are not wanting of its being postponed for eight, ten, or even twelve days.

§ 1. CAUSES.

The causes of eclampsia have been divided into predisposing and determining.

Upon a careful investigation of the individual conditions under which eclampsia is generally found to occur, we are forcibly struck with a singular circumstance, which entirely escaped the notice of the older observers: this circumstance is the almost constant presence of albumen in the urine of eclamptic women. I say almost constant, for, with the exception of six or seven cases mentioned by M. Depaul and Mascarel, in reference to which we shall have more to say hereafter, I am aware of nothing to limit the assertion. This very remarkable coincidence, which is at present well determined by the observations of many physicians, and which I have invariably remarked in all the cases which have come under my own notice within the last eight years, evidently seems to be the dominant fact in the etiology of puerperal convulsions. Since the presence of albumen is discovered almost constantly in cases of eclampsia, the severest mind can hardly avoid establishing a more or less intimate relation of causality between the two facts.

But it has been observed, the presence of albumen in the urine does not constitute a disease; it is but the symptomatic expression of a local lesion, or of a general affection of the economy. The latter are doubtless capable of producing eclampsia as they had already caused albuminuria; but most frequently their influence is limited to the modification of the urinary secretion without producing any nervous disorder. This is true, and M. Blot was right so far as he considered these two morbid conditions as merely concomitant, and not that one was a consequence of the other. M. Blot's remark has not, however, in a clinical point of view, all the importance that has been attributed to it. Though the cause of eclampsia be attributed to an organic lesion of the kidneys or to an alteration of the fluids of which albuminuria is the symptom, it is nevertheless true, that as both these general or local lesions are to be detected with great difficulty during gestation, whilst the presence of albumen may always be discovered with ease, it was judicious to insist upon the importance of the albuminuria, which is alone capable, in most instances, of exciting a suspicion of the organic condition to which the eclampsia is apparently due.

Since albuminuria is present in the immense majority of eclamptic women, it, or rather the disease of which it is the symptom, may be rightfully regarded as the predisposing cause of eclamptic convulsions. I say the only known predisposing cause; for, since attention has been fixed upon this point, of all pregnant women, those only who are affected with albuminuria (a few cases excepted) have been known to be attacked with convulsions.

Though all eclamptic patients have albuminuria, it does not follow that albuminuria, however severe, necessarily gives rise to convulsions. Happily, it is by no means uncommon for pregnant women to have the urine highly charged with albumen without presenting a single convulsive symptom. Of 41 women with albuminous urine, observed by M. Blot, but 7 had convulsions; and of 20 mentioned by MM. Devilliers and Regnault, 11 only were affected with them. The latter gentleman, it is true, examined the urine of such women only as were dropsical, and it is very certain that many cases of albuminuria are not attended with infiltration. Still, by taking the mean between these different results, and having regard to my own observations, I think that I come near the truth in saying, that one out of every four or five patients with albuminuria will be affected with convulsions.

The amount of albumen in the urine increases greatly during the convulsive attack, and generally diminishes after it. This peculiarity has led some persons to inquire whether the eclampsia, instead of being due to the alteration of the urine, might not be the cause of it. I can understand why there might be hesitation in regard to this point, if a single case could be cited in which it had been proved that the urine was entirely free from albumen for several weeks before the appearance of the accidents: this, I believe, has never been done, but often, on the other hand, albuminuria has been known to be present for some time before the convulsions occurred. Besides, when we come to reflect upon the obstruction the venous circulation produced by eclampsia, we can very readily account for the active congestion with which the internal organs, and the kidneys in particular, may be affected during the attack. Now, it is well known that renal congestion increases the secretion of albumen.

The organic conditions which produce albuminuria are certainly the most, I would even say the only ones, favorable to the production of eclampsia. This proposition, which is at present incontestable, explains the influence of certain circumstances which most authors have mentioned as predisposing causes: thus, among the latter has been classed as one of the most active, œdema of the lower extremities, when considerable, but, above all, general infiltration, invading successively the body, upper extremities, and face. It is now a well-ascertained fact, that this general œdema is almost always connected with an alteration of the urinary secretion, and that only when accompanied with albuminuria does it appear to give rise to eclampsia.

If it be true, as M. Rayer thinks, that the compression exerted by the developed uterus upon the renal vein may eventually produce hyperæmia, and then an inflammation of the kidneys, we are able to understand the mode of action of all the circumstances capable of increasing this compression. Thus, we can explain the possible effect of, 1, the extreme distention of the uterus, whether due to dropsy of the amnios or to the presence of several children; 2, of a first pregnancy, in which the uterus is strongly applied to the posterior walls of the abdomen, in consequence of the resistance of the abdominal parietes;[1] 3, why, according to the observations of M. P. Dubois, rachitis is often connected with eclampsia, since, in women affected with this disease, the small stature and limited space within the abdominal inclosure, obstruct the development of the uterus, which, by reacting in its turn upon the surrounding parts, forms a greater mechanical obstacle to the regular fulfilment of all the functions, and the venous circulation in particular. (See *Albuminuria*, p. 488.)

Whatever the cause may be, long-continued albuminuria necessarily occasions a notable diminution of the amount of albumen which enters into the normal composition of the blood. Hence it is extremely probable that this fluid, when thus altered, gives rise to a peculiar excitement of the cerebro-spinal centre, which becomes itself the direct cause of the convulsions, or, at least, which is more frequently the case, renders it more susceptible of the excitements which reach it either from without, or from previously irritated internal organs. These excitements, which, under any other circumstances, would have no effect, become here so many determining causes of an attack of eclampsia. (See *Uræmia.*)

---

[1] Seven-eighths of the cases of eclampsia have occurred in primiparous women (Lachapelle); in thirty-eight of those reported by Merriman, twenty-eight were of this class; and more than two-thirds of the instances given by Ramsbotham, and twenty-nine in thirty of those by Collins, refer to women who were delivered for the first time.

An alteration in the quantity or quality of the blood often gives rise to convulsions under other circumstances than the puerperal condition. M. Rayer, and several other observers, have called attention to symptoms resembling epilepsy, as one of the modes of termination of albuminuria caused by albuminous nephritis, and it is well known that convulsions often occur in the last moments of the unfortunate victims of profuse hemorrhage. It is, therefore, no cause for astonishment, that the alteration of the blood produced by albuminuria may have the same consequences during pregnancy. The reason why these nervous disorders are more frequent in pregnant women with albuminous urine than in the other diseases attended with albuminuria is, that to the only producing cause of epilepsy, in ordinary cases of albuminuria, are added the congestions to which the nervous centres are so liable during pregnancy and labor.

Although the convulsions are generally spontaneous, and may be attributed simply to the condition just mentioned, there are some whose appearance seems to be connected with a more readily appreciable cause, and which, therefore, may be justly regarded as a determining cause.

In the list of occasional causes, certain writers have included the most common and indifferent circumstances, the mere recital of which we shall spare the reader; but will simply mention strong moral emotions, whose influence, though incontestable, is in some cases hard to be explained. There are some, however, which, in reference to treatment, deserve a careful mention, for it is especially by removing the cause that the attack may be arrested, or at least rendered less dangerous.

The influence of the circumstances to which we allude is at first limited to organs at a greater or less distance from the nervous centres, and it is only secondarily that the irritation transmitted to the latter excites them, and gives rise to the convulsion. Thus it is that an irritation of the nerves of the uterus, vagina, bladder, rectum, or stomach, may become the determining cause of general convulsions.

A. *Uterus.*—All the causes of essential dystocia, which require longer continued and more powerful efforts on the part of the womb, may occasion an excitement of the sensitive nerves of this organ, which, when transmitted to the spinal marrow, is calculated to awaken the reflex action of the motor nerves. Under this head we would indicate a malformation or obstruction of the pelvis, a partial or complete obliteration of the vagina or vulva, organic alterations, and spasm of the body or neck of the womb, fœtal deformities, or monstrosity, &c. Unfavorable positions of the child have not, certainly, so great an influence as might at first be supposed. Churchill says that "the effect of unfavorable positions has been greatly exaggerated, for Drs. Clark, Labatt, and myself have witnessed but a single case of convulsions coinciding with a bad position in 48,397 labors." In cases of eclampsia the head is almost always the presenting part; but, as Tyler Smith remarks, the first attack does not come on at the moment the head presses upon the neck or clears its orifice, but rather when it distends the perineum, and partially dilates the vulva. It is then, especially, that a prompt termination of the labor puts an end to the convulsive attack by removing the pressure from the soft parts.

All the unfortunate circumstances that may complicate the labor and require the introduction of the hand, whether before or after delivery, should be mentioned as capable of producing the same excitation; such are encysted placenta, its abnormal adhesions, its partial or complete retention, the presence of large clots, retroversion of the uterus, &c.

B. *Intestinal Canal.*—The irritation produced by distention of the intestinal canal, and especially by the accumulation of large quantities of fecal matters, and the presence of worms or foreign bodies in the large intestine, is sometimes also the determining cause of eclampsia.

Both Merriman and Chaussier have insisted upon the influence of a saburral condition of the primæ viæ, which influence is, they say, sufficiently shown by the state of the tongue, and epigastric pain which the patient nearly always complained of at the onset of an attack.

The presence of indigestible food in the stomach appears, in some cases, to have been the cause of convulsions. John Clarke relates the history of several women who were so affected after delivery, in consequence of having eaten largely of oysters.

C. *Bladder.*—Lastly, the same may be said of irritation of the walls of the bladder produced by its extreme distention with urine. The curious observation of Mauriceau is well known, and Dr. Vines mentions an exactly similar case. In the latter, the convulsions which had for two days resisted the delivery and all the generally recommended means, ceased immediately upon withdrawing from the bladder, by means of the catheter, five pints and a half of a turbid and highly ammoniacal urine.

Numerous other predisposing causes have likewise been described, the influence of which, however, it must be acknowledged, is far more difficult to appreciate; thus, for instance, M. Baudelocque enumerates in his thesis, a residence in large cities, the use of small or tight garments, an over-succulent diet, the abuse of spirituous liquors, constipation, retention of the urine (pointed out by Delamotte), sexual intercourse, the suppression of an habitual discharge, too much sleep, want of exercise, the frequentation of balls or plays, anger, jealousy, bickerings, disappointments, &c. There can be no doubt that all these causes, by modifying or disordering the circulation, may render it more active, and thus facilitate a sanguineous determination towards the brain; but they should evidently be considered in the light of a secondary predisposition, which may be added to some one of those mentioned above.

Epilepsy has also been considered, though improperly, as constituting a predisposition to eclampsia; for, though the two diseases have a close analogy, yet those pregnant women who were epileptic before their gestation commenced, are less subject to attacks then than at any other time. Indeed, some authors have supposed that pregnancy suspends the epileptic fits altogether; but this is not absolutely the case, for they only occur then more seldom than usual.

Dr. Tyler Smith relates a curious case of an epileptic woman who had an attack immediately after what she regarded as the fecundating intercourse, and who experienced an entire suspension of the disease during the remainder of her pregnancy.

We would repeat, in terminating this etiological study of eclampsia, that the various determining causes exist very frequently without giving rise to convulsions. The reason of this is, that they are of themselves incapable of producing them, and have no real influence except in cases presenting in a greater or less degree the general or local lesion which occasions albuminuria.

A review of all the causes will enable us to explain their mode of action. It is evident that all of them have a tendency to produce an irritation of the nervous centres. This irritation is direct, when due to the immediate contact of vitiated blood, and indirect, or by reflex action, when it follows the excitement of a distant organ, as the bladder, uterus, &c. I am happy to find in the work of Scanzoni a confirmation of these views, long since proposed by me. Setting out with these ideas, Scanzoni divides eclampsia into, 1. *Reflex convulsion*, proceeding from the peripheral extremities of the irritated sensitive nerves; 2. *Spinal convulsion*, produced by direct irritation of the spinal marrow, which irritation is transmitted to the peripheral extremities of the nerves; 3. *Cerebral convulsion*, when the irritation resides in the brain, and is transmitted to the spinal marrow. The existence of this latter form is doubtful, and, for our own part, we are much disposed to believe that eclampsia always has its origin in spinal irritation. It is a fact, proved experimentally by physiologists, that irritation of the spinal marrow, of the medulla oblongata, or of the tuberculæ quadrigeminæ, gives rise to convulsions only, whilst irritation of any other part of the brain produces nothing of the kind. It is true that cerebral lesions may destroy voluntary motion, but involuntary contractions, the excess and disorder of which constitute eclampsia, are not affected by them in the least. The latter may be produced by irritation of the spinal marrow or of its nerves, even when the cerebrum and cerebellum have been completely destroyed.

§ 2. SYMPTOMS.

Like Madame Lachapelle, we shall describe three orders of phenomena in the attack of eclampsia, which, under the triple aspect of diagnosis, prognosis, and treatment, are of great importance, namely, the precursory symptoms, those which are manifested during the fits, and those which are sometimes developed in their intervals.

A. *Precursory Phenomena.*—An attack of eclampsia scarcely ever appears unexpectedly, as it is almost always preceded by certain phenomena, which enable us to foretell its speedy invasion. Chaussier even supposed these to be so constantly present, that, in the few exceptional cases where the observers have not mentioned them, it was because they were of short duration, and, therefore, either passed away unperceived, or else were misunderstood. This opinion is, however, rather too unqualified. The precursory symptoms are sometimes absent, and, as M. Wieger remarks, the comparative frequency of the prodromes differs according to the periods at which the convulsions make their appearance. Those which come on before labor are, he says, preceded by premonitory symptoms in forty per cent. of the cases; those appearing during labor or the delivery of the placenta, have the symptoms in thirty per cent.; and such as are delayed until after delivery, in twenty per cent. of the cases.

These precursory phenomena are variable in duration; thus, for some days, though occasionally only for a few hours, before the invasion of the puerperal epilepsy, the patients complain of agitation or malaise; they are easily excited, are impatient and irritable; they experience a marked difficulty in respiration; and they suffer from an exceedingly poignant and acute pain in the head, which, like the megrim, occupies but one-half of the cranium, and sometimes is even still more concentrated, and appears fixed upon one coronal boss, or some other equally circumscribed point. This pain in the head, which is one of the most important diagnostic signs, nearly always resists all the curative measures usually employed; it is accompanied with nausea, or even vomiting, by vertigo, dimness of vision, tinnitus aurium, and sometimes by an acute pain in the epigastrium. (Chaussier, Denman.)

When these primary symptoms have lasted for some time, they acquire a greater degree of intensity, and are often complicated with a more or less marked disorder in the sensorial and intellectual faculties. The vision becomes affected, the sight seeming to be obscured by a thick mist, and the patient distinguishes objects less clearly; sometimes even, as in a case observed by Dr. Meigs, of Philadelphia, she sees only one-half of an object held before her.[1] The hearing is likewise less distinct; the touch not so fine and less delicate; the woman's countenance exhibits an unusual hebetude; the expression is fixed, the lineaments immovable, and she appears sunk in a deep abstraction, from which she can only be aroused with some difficulty; she scarcely comprehends the questions addressed to her, and very frequently replies incoherently. In a plethoric female, the pulse is full, slow, and hard, and the face is occasionally flushed and animated; on the contrary, where the patient is affected with anasarca, particularly if she happens to be of an irritable, nervous constitution, the pulse is small, hard, and contracted, the face is pale and the skin cold, especially on the extremities; and sometimes there is a slight chill, or an imperfect horripilation. In addition to these, some women experience pricking sensations and formications in the limbs.

When the eclampsia appears during labor, it is often preceded by extreme indocility and agitation; the uterine contractions also present for a time that peculiar character of continuity and irregularity which has gained for them the name of uterine tetanus.

The patient laughs and weeps alternately, and speaks with volubility. A state of hebetude and stupor sometimes succeeds to this extreme agitation.

[B. *Phenomena of the Attack.*—After the premonitory symptoms just mentioned have continued for a length of time, and in a degree which are liable to great variation, the first paroxysm occurs, and sometimes very suddenly. The very faithful picture of it drawn by M. Prestat in his inaugural thesis, would lead one to suppose that he was reading the description of an attack of epilepsy, so striking is the resemblance of these affections to each other. Dr. Soyre, to whom we are indebted for excellent works upon the disease, very properly, therefore, in his inaugural thesis, divided the attack of eclampsia into certain stages, as Dr. Beau had already done for the paroxysm of epilepsy. The only fault which we find with them both is for making the coma one of the stages of the attack, whereas it is but the end of it. We shall, therefore, admit three stages in the paroxysm of eclampsia: 1. The stage of initiatory convulsions. 2. The stage of tonic convulsions. 3. The stage of clonic convulsions.

---

[1] It seems to me that these disorders of vision are not due, as hitherto supposed, to cerebral congestion preceding the eclampsia, but that, in at least the majority of cases, they are consequent upon the lesion producing the albuminuria. It is well known, indeed, that disordered vision and even blindness are not uncommon occurrences in Bright's disease.

1. *Stage of initiatory convulsions.*—These almost always begin in the face, the muscles of which are affected with very limited and very rapid choreic motions, readily perceptible through the skin. The eyelids wink very rapidly, but sufficiently to show the globe of the eye, which rolls upward and downward several times successively. The strongly contracted muscles of the alæ nasi dilate the nostrils; the mouth is partly open, and soon becomes distorted by the depression of one of its corners. The convulsions of the face are always more marked on one side than on the other; finally, the head inclines in the same direction, and approaches the shoulder.

At the same time, the limbs, especially the arms, are affected with convulsive jerkings. The forearms are violently pronated; the fists are closed, with the thumb either bent into the palm, or extended and inserted between the forefinger and the medius. This stage rarely lasts longer than a minute.

2. *Stage of tonic convulsions.*—Suddenly, the look becomes completely fixed; the countenance, taken as it were by surprise, and rendered immovable in the midst of its grimace, exhibits barely a few limited fibrillary contractions. The tongue is thrust out of the mouth, the masseters close the jaws strongly, and the tongue is badly bitten, unless care has been taken to push it in, or prevent the teeth from coming together.

The limbs and the trunk stiffen in the just described attitude; breathing is suspended, and there is an instant of general immobility, when death seems impending. This stage is very short, rarely lasting over a few seconds.

3. *Stage of clonic convulsions.*—Relaxation soon occurs, and the tonic spasm subsides to be succeeded by clonic convulsions, which appear simultaneously in various parts of the body, giving rise to shocks corresponding with alternate contraction and relaxation of the muscular system.

The face, which had been drawn to one side, returns to the median line; the head vibrates from one side to the other. The eyelids open and close suddenly, with rhythmic regularity. The orbicular, canine, and zygomatic muscles of the lips are jerking, and the patient seems to be chewing or endeavoring to mumble some words. Respiration is imperfect and quickened. The face is congested, swollen, and acquires a bluish or livid hue.

Air, mixed with saliva and blood from the wounded tongue, gives rise to a bloody foam, which fills the mouth and is discharged between the lips. The appearance of the patient is then truly hideous.

The convulsive movements of the limbs are generally quite limited in extent: if the woman is lying on her back, she retains the position without need of holding, and it is only necessary to take care that she does not fall out of bed.

The clonic convulsions occur twice, thrice, or even four times or more per second. Though this stage of the attack is generally short, it is liable to be prolonged; cases are noted in which it lasted ten minutes, and I know that I have seen it last for twenty minutes, by the watch.]

The muscles of the hollow organs do not remain altogether indifferent to the disorder in the external muscular apparatus; for the fecal matters, the urine, and the contents of the stomach, are often expelled by the convulsive contraction of the reservoirs in which they had accumulated.

The respiration is interrupted, noisy, and affected by continual jerkings without any regular order; sometimes, indeed, as Madame Lachapelle has observed, it is wholly arrested by the spasmodic contraction of the diaphragm and other muscles of the thorax.

According to Dr. Tyler Smith, the muscles of the larynx are contracted convulsively, so as to obliterate the glottis almost completely; hence the respiration is either suspended or noisy, and the inspiration short and quick; consequently, hematosis is either suspended or diminished. This momentary asphyxia explains satisfactorily the bluish, or even blackish color of the face and extremities, the swelling of the head and neck, which are gorged with black blood, as also the frightful turgescence of the skin, eyes, and tongue. The carotids beat violently, and the jugulars stand out prominently. The secretion of the salivary glands is increased by their congestion. The jaws are closed forcibly, and in consequence of the approximation of the teeth, and the quantity of saliva in the mouth, the air escapes with a hissing noise, and by agitating the saliva, forms a thick foam, which is expelled continually from the mouth. This foam is not unfrequently stained with blood from wounds produced in the tongue by the teeth.

The spasm of the pharynx renders swallowing impossible, so that substances placed upon the base of the tongue, remain there to the risk of producing asphyxia. In a case of this kind, Dr. Simpson (of Stanford) excited deglutition by placing the substance to be swallowed in the upper part of the pharynx, and sprinkling the face with cold water.

According to Dr. Smith, the muscular fibres of the heart may also participate in the general convulsion. The extreme lividity and turgescence of the entire surface of the body are sometimes greater in eclampsia than in ordinary asphyxia, the entire body being in the condition in which the head is found in persons who have been hung. Dr. Smith thinks that this state is attributable to the venous circulation; may it not be asked, he says, whether there is not a spasmodic contraction of the right auricle, giving rise to a congestion of the entire venous system from the vena cava to the capillaries? And is not this supposition confirmed by the autopsy, exhibiting, as it does, the ventricles and auricles completely emptied of blood?

A very remarkable circumstance, and one which seems to me to prove the uræmic nature of eclampsia, is the suspension for a longer or shorter time of the urinary secretion. I have had occasion, several times, to introduce the catheter during the attack, and have found the bladder quite strongly contracted, and entirely empty. In the majority of cases, I have not been able to obtain more than half a spoonful of urine, whilst in others it was impossible to extract a drop. It is well known that ischuria is one of the symptoms of poisoning by uræmia.

At the commencement of the fit, the pulse is full and hard, subsequently becoming smaller and almost imperceptible; the skin is hot and dry, and is soon covered by a profuse perspiration. This transpiration usually coincides with a diminution in the frequency and intensity of the spasm, and announces its speedy termination. While it lasts, the sensorial and intellectual functions are wholly abolished; the patient is conscious of neither sound nor light; the sensibility is entirely lost, and we may pinch, incise, or burn the skin with impunity, and without her knowledge, and even without her recollecting it after the fit.

The effect of the convulsions upon the contractility of the uterus is extremely variable. During the attack, the uterus sometimes remains passive, astonished, as it were, at the universal disorder; whilst, on the other hand, there are cases in which, whether the eclampsia comes on during labor or precedes it, the contractions continue with their normal regularity. Occasionally, also, it seems to participate in the general irritation, and expels the fœtus very rapidly, even when the slight dilatation of the neck would appear to indicate that delivery was yet distant. This rapid expulsion, of which the patient is entirely unconscious, may escape the attention of the accoucheur, and in some instances the child has died asphyxiated between the mother's thighs, for want of the proper attentions.

I think, however, that these rapid deliveries are far less frequent than some accoucheurs imagine. The idea of an earlier delivery than usual may have had its origin in a neglect to ascertain the condition of the cervix, which may have become dilated without the consciousness of the female. Whenever I have been able to follow up the labor, the cervix has always appeared to me to dilate very slowly, and has often seemed to be contracted spasmodically, as though it participated in the general convulsions. The expulsive stage is, I think, shorter than usual, a fact readily accounted for by the energy of the uterine contractions and the slight resistance of the perineum, the muscles of which are in a state of resolution during the coma.

Although the fits do not accompany each pain, they nearly always come on just at the commencement of one. "This appears to me to be so manifest and decided," says Dewees, "that I think I could tell what is going on at the mouth of the uterus, without an examination per vaginam." This, however, is not always the case; for, under some unusual circumstances, the contraction appears only when the convulsion has reached the lower extremities. Therefore, although in the first case the uterine action appears to determine the convulsive attack, in the second it seems to be the consequence of it. It is possible that this difference may furnish an explanation of the variable effect of eclampsia upon the termination of labor.

The cessation of the convulsive attack is never abrupt; the movements and spasms gradually become less violent; the respiration is less hurried and more full; the face loses part of its lividity; the muscles are only agitated at intervals, and their action resembles that which is excited by passing a brisk electric shock through them.

In general, the first fit is of short duration, and not very violent; but, in most cases, the fits are repeated frequently, and the symptoms become more and more frightful in proportion as they are renewed; the succeeding one, say Merriman and Velpeau, being often heralded by an uncommon slowness in the pulse. In the latter paroxysms, Madame Lachapelle has remarked that the convulsive shocks are less considerable, and sooner over than the earlier ones, but that the comatose symptoms are more grave and persistent. I do not regard this as correct, but it is true that the comatose symptoms are more serious and persistent.

The duration of an attack is very variable. The first fits are commonly the shortest, becoming more prolonged as they are renewed. At first, they last from one to two minutes, and afterwards from three to four; but they rarely exceed six to eight minutes. It is said that they have lasted for a quarter or half an hour, and even for a whole hour; but those authors who pretend to have known them to continue for several hours, have evidently regarded both the convulsive and comatose periods as parts of the paroxysm. The number and rapidity of the convulsions are equally variable; in nearly all cases, there are two or more, and sometimes they have reached as high as sixty. In some instances, there is an interval of several hours, or half a day, between them; while in others, on the contrary, only a few minutes elapse before the return of the next.

C. *Interval.*—The patient remains in a state of complete prostration during the intervals of the first three or four paroxysms; but she soon comes to herself, opens her eyes, and looks at everything around with astonishment; she scarcely recognizes the persons and objects about her, and cannot be made to comprehend the distress and anxiety of her friends and family, for she has no knowledge of what took place while the fit lasted; but in a short time her ideas become clearer, and at length she entirely recovers the use of her faculties. These lucid intervals are quite prolonged after the early attacks; but, as they are renewed, the moments of intelligence become shorter and shorter during their intervals, and the woman ultimately sinks into a state of profound coma or apparent death; from which she is only aroused by the return of fresh convulsive movements.

This comatose state presents all the characteristics of an intense cerebral congestion, of which indeed it certainly is a consequence. Even if it be supposed that during the convulsion the muscular fibres of the auricles present no obstruction to the return of the venous blood, the violent contraction of the muscles of the neck certainly compresses the veins there situated, and, by preventing the return of the blood, gives rise to cerebral congestion, which produces the insensibility during the attack, and the sleep which follows it. The stupor is profound, the face injected, the respiration stertorous, and the limbs are in a state of perfect flexibility; but the sensibility, though greatly blunted, is rarely lost altogether, for when we pinch the patient, or rub her roughly, she shows signs of uneasiness, and groans very much like individuals who are laboring under a severe concussion of the brain. However, the torpor may be such that the sensibility is entirely lost; but even then the female appears to be conscious of the pain caused by the uterine contraction, for, when the latter comes on, she evinces by her countenance and groans, the sufferings she experiences. The intellectual faculties seem to be wholly abolished, the pupils are dilated and insensible. In general, the pulse is strong and developed.

When this comatose state is about passing off, it changes into a somnolency, from which the woman may be aroused by speaking to her; and the sensorial faculties gradually return. When the torpor is dissipated, she complains of great fatigue, and of a feeling of painful weariness; then, at the end of a variable period, this prostration gives way to great anxiety, the prelude of a fresh attack.

§ 3. TERMINATION OF ECLAMPSIA.

An attack of eclampsia may terminate either by recovery, by death, or by giving rise to some other disease. When the patient is likely to get well, the paroxysms are usually few in number, of short duration, and occurring after long intervals. During this latter period, the female recovers more or less completely the use of her limbs, as also of her sensorial and intellectual faculties.

When there is to be no return of the fit, the intellectual faculties are the longer in regaining their normal condition as they have been the more disordered, or as they have been suspended for a greater period. The memory particularly is much weakened, sometimes even is altogether destroyed, for the patient not only cannot recall what took place during the fit, but she has likewise forgotten the common occurrences of the few days preceding the invasion of the symptoms; and it is only restored by degrees, each hour adding some facts to those of which she had previously recovered the recollection. It is singular that this defect of memory is often limited to isolated words; thus some have been known to forget entirely the names of their nearest relatives; others could no longer recall the name of the street, or the number of the house they occupied; and certain others again had entirely lost the memory of dates.

Alphonse Leroy reports one instance in which a very singular aberration of vision followed some convulsive phenomena, that held the patient's life in jeopardy for several days; all the objects that were brought before her, and all the surrounding persons, looked black.

The sight and hearing likewise require a certain time for tne recovery of their perfect integrity; the woman's general condition is thus gradually ameliorated, and ultimately she regains her usual health.

On the contrary, when the disease is about to terminate by death, the convulsive attacks are observed to last for four, five, or six minutes with great intensity; they occur in rapid succession, and during the interval that separates them, the female is sunk in a torpor, from which she cannot be aroused by any external irritants. The period at which death takes place under such circumstances is very variable, though in general it is between twelve and forty hours after the invasion of the first symptoms. Sometimes, however, the patient dies at the outset of the disease. The head, says M. Depaul, began to distend the perineum and appear at the vulva, and there was nothing to excite alarm, when I suddenly observed a change in the patient's countenance, characterized by convulsive movements, and grimaces, heralding eclampsia, and death followed immediately.

The child was extracted alive by the forceps, but it died a few minutes after with eclamptic convulsions.

Death may occur in the convulsive stage, or in that of the coma. In the former case it is evidently due to asphyxia, which is itself produced by the paralysis, or rather by the permanent contraction of the muscles of the chest and of the glottis;[1] in the latter, it is a result of the cerebral congestion, and sometimes even of a true apoplexy.

---

[1] This asphyxia might also result, according to Boër, as a consequence of the obstruction of the bronchial ramifications, in which a considerable quantity of frothy mucus sometimes accumulates.

Finally, there is no reason why we should not admit, with M. Aran, that death may, in some cases of eclampsia, result from a sudden arrest of the movements of the heart.[1]

Again, an attack may not be grave enough to end in death, and yet may give rise to several very serious disorders. For instance, when the eclampsia occurs in the commencement of the labor, the violent contractions of the womb may cause rupture of the organ, if the os uteri is not sufficiently dilated. Again, it is possible that the disorders in the circulation may occasion a cerebral congestion; and the consequent engorgement of the vessels of the brain may be such as to produce their rupture, which is followed by an apoplectic effusion, and, as a consequence, by hemiplegia. In plethoric women, this anatomical lesion might even be produced by the early paroxysms; and it is probably in this way that the cases observed and described by M. Méniere, under the name of puerperal apoplexy, might be interpreted.

A sanguineous determination may also take place toward the lung, and thus produce congestion of that organ.

As a possible consequence of the congestive condition of the brain and its membranes, we should also mention a state of irritation, which occasions and maintains for a longer or shorter time, a complete or partial delirium, and sometimes even, the symptoms of a true meningitis or meningo-encephalitis. Of the seven eclamptic women treated at the Obstetrical Clinic, whilst I was on duty, four presented evident symptoms of meningitis after the coma had entirely passed off; two of them died, and exhibited the anatomical characters of meningitis at the autopsy.

But independently of these unfavorable complications, which constitute so many new diseases for the physician to combat, there is another one which is less immediate, but not less rare, says Madame Lachapelle; that is puerperal peritonitis.

In conclusion, certain cutaneous or intestinal inflammations may result in consequence of the energetic measures employed against the eclampsia. Thus, the life of the patient has sometimes been endangered by an attack of entero-colitis. The sinapisms, also, which are then crowded on the lower extremities, are not felt by the patient, and may be forgotten in the general agitation; consequently, they remain applied too long, and thus produce erysipelas and severe vesications. A lady, reported by M. Velpeau, was attacked, on the second day of her convalescence, by a violent erysipelas over the whole leg, because the sinapisms applied there produced no effect at first, and therefore were allowed to remain on too long.

---

[1] The heart, says M. Aran, is a muscular organ, and as such is certainly liable to have its innervation affected, as also the properties with which it is endowed as a contractile agent, that is to say, its irritability, motor power, and tenacity.

To whom, for example, is it not evident, that if the heart, which is sometimes known to be lacerated by its own contractions, should be paralyzed by an interruption of nervous action or by the loss of some of its muscular properties, death would be instantaneous? Would it not be equally so, if, instead of ceasing to contract, it should be affected with spasm, as happens to some of the external muscles? May it not be supposed that several convulsive neuroses, in which death sometimes takes place suddenly, as epilepsy, eclampsia, spasm of the glottis, &c., prove fatal less from deficient hæmatosis than from a complete and instantaneous cessation of the pulsations of the heart?

§ 4. DIAGNOSIS.

The minute detail into which we have entered in describing the symptoms of eclampsia might possibly dispense with a return to its principal characters; but as there are some affections that have a strong analogy to puerperal convulsions, we shall again bring forward the signs by which they can be distinguished.

When considered as a whole, eclampsia is so easy to diagnosticate, and its symptoms are so well marked, that it really seems useless to recapitulate them; but it is composed of two widely different stages, the paroxysmal and the comatose, during either of which the physician may be called upon to decide what is the nature of the affection. Thus, during the paroxysm, it may be confounded with hysteria, epilepsy, catalepsy, or tetanus; while apoplexy, concussion of the brain, and the coma of drunkenness may be mistaken for it in the comatose stage.

However, in hysteria there is sometimes an alteration, but never a total abolition, of the intellectual powers; indeed, the sensorial faculties have an unusual degree of delicacy and perfection; there is no coma after the fit, and the convulsive movements are altogether different from eclampsia; thus, the limbs become forcibly flexed (instead of being extended,) and subsequently writhe with violence; there is a continual tendency to change the position, and the patient would certainly throw herself out of bed if she were not held down by vigorous arms. Again, an hysterical paroxysm is nearly always preceded or accompanied by the sensation of a ball rising from the hypogastrium towards the throat, which gives rise to a feeling of suffocation similar to that produced by strangulation.

Deglutition is very difficult or impossible, but the muscles are much less strongly contracted, and instead of that whistling respiration which indicates constriction of the throat, there are loud cries, proving a free opening of the larynx. There is almost never frothing at the mouth as in eclampsia. The thumb, instead of being flexed in the palm of the hand, is extended outside of the other fingers, which are flexed. Finally, hysteria generally appears in the early months, whilst eclampsia appertains more particularly to the termination of pregnancy.

But of all the convulsive affections, epilepsy is the most likely to be confounded with eclampsia. It is unusual, however, for the patients to utter a cry at the beginning of an attack of eclampsia, as is very common in epilepsy. This is the first point of difference as noted by Chailly and de Sailly, and which I can confirm from personal observation. Succeeding the epileptic paroxysm there is little or no coma, which is always present to a greater or less degree after puerperal convulsions. Still, as epilepsy is sometimes followed by a profound coma, it will be necessary to examine the urine, which will not usually be found to contain albumen as it would in a case of eclampsia.

Moreover, in the latter disease, microscopic examination of deposits in the urine within twenty-four hours after its evacuation, may detect the presence of the cylinders of fibrin described by German authors, as well as blood and mucus corpuscles and epithelial cells from the ureters.

It is well, however, to bear in mind that the same observation applies to the presence of these cylindrical bodies in the urine as to the albumen and blood, namely, that sometimes few or even none are detected by the most careful examination; and the same thing has been observed in all varieties of Bright's disease. It has been shown by Weld, that the occurrence of these exudations is intermittent, and that, consequently, there are times when none are present in the kidneys. This explains why some observers, M. Blot, for example, have never met with them.

The persistence of the convulsive rigidity of the limbs distinguishes tetanus from every other disease. Finally, catalepsy presents as an essential character the singular peculiarity,—that the extremities often preserve throughout the whole fit the position which they happened to have at its commencement, or any one we can succeed in making them assume during this convulsive state.

The comatose stage of eclampsia will be distinguished from apoplexy by the following signs: it has been preceded by convulsive phenomena, which is not the case in the latter disease; all the extremities are in a state of complete resolution, and they have entirely lost their sensibility and mobility; and, most generally, only hemiplegia results as a consequence of the cerebral effusion. It must, however, be observed that, when the eclamptic paroxysms are frequently renewed, and the patient's intelligence has been lost for some time, the cerebral congestion, which keeps up the coma, may determine an effusion into the substance of the brain. Hemiplegic phenomena then appear at once, and it will be possible to detect, on the side opposite to the one where the effusion took place, a more complete loss of sensibility and mobility, though the limbs on the other side may be in a state of resolution. The reader will understand that, if the previous history were unknown, the diagnosis would then be very obscure. The loss of intelligence is always constant and total in eclampsia, whilst this phenomenon may be wanting in apoplexy, or be limited to a simple obtuseness.

In cases of concussion of the brain, the absence of all previous convulsions, together with the presence of the marks of a fall, or of a violent blow on the head, will serve to make out the diagnosis.

Lastly, the previous history of the patient, the ejection of the contents of the stomach mixed with a large quantity of alcoholic liquors, and the vinous odor of the breath of intoxicated individuals, will enable us to distinguish the coma of drunkenness from that of eclampsia.

§ 5. PROGNOSIS.

Eclampsia is a very dangerous affection, but we cannot agree with Madame Lachapelle, who states that one-half of the women affected with it are lost. In order to appreciate this conclusion from the practice of the illustrious midwife, it is necessary to bear in mind the peculiar conditions in which the patients at La Maternité are placed. After consulting the numerous cases which I have had occasion to observe, I think I might safely say, that when the patients receive proper care in due time, the mortality is hardly greater than one out of three and perhaps four.

The prognosis varies, however, according to the cause that gave rise to the convulsions, to the stage of the puerperal condition at which they are manifested, and to the particular progress of the symptoms.

Of all the various predisposing causes, serous plethora, or a partial or general infiltration, says Madame Lachapelle, must give rise to the most unfavorable prognosis. This proposition now appears to us a great deal too absolute. General infiltration should doubtless be considered as predisposing to eclampsia much more than partial œdema; but when the disease has once appeared, the general or partial infiltration adds nothing to the gravity of the prognosis. This results evidently from the observations of MM. Blot, Regnault, and Devilliers. Thus, of four patients with eclampsia, observed by M. Blot, three died, whilst all of three others affected in the same way, but free from œdema, recovered. So, also, MM. Regnault and Devilliers, who had two deaths for two non-infiltrated cases of eclampsia, observed but five deaths for nine œdematous cases, and three others fell victims to later complications succeeding the eclampsia. In short, the patients with eclampsia and albuminuria, without œdema, give a mortality of 7 out of 15; and those with œdema, a mortality of 11 out of 51.

As albuminuria is almost always pre-existent to eclampsia, it can have no other effect than is referable to its longer or shorter duration and its quantity. Albuminuria of very recent date, or of the kind styled transitory, and which gives only a slight cloud by the use of reagents, will lead to a much less unfavorable prognosis than if it had existed for several months and had afforded a copious deposit of albumen. An old case of albuminuria always supposes an advanced disease of the kidney, or else an altered state of the fluid. The cases observed by MM. Devilliers and Regnault, prove that death then occurs most frequently either during the coma, or as a consequence of ulterior complications. The following table of 36 cases, by Braun, leads to the same conclusion.

ALBUMINURIA.	NO. OF CASES.	MOTHERS CURED.	DIED.	
			IN THE CONVULSIONS.	OF COMPLICATIONS.
Very severe, ...	3	1	2	0
Very considerable, . .	7	3	3	1
Considerable, ...	14	9	4	1
Moderate, ...	8	7	0	1
Slight, ...	4	4	0	0

The convulsions that are developed in hysterical and epileptic patients, or in women of great nervous susceptibility, and those which succeed any acute moral emotion, are less formidable than those which have no relation with the former nervous state of the female. Finally, the eclampsia that can only be explained by the general alteration of the blood produced by albuminuria, is much more dangerous than that whose appearance seems connected with the irritation of some organ, as the uterus, bladder, intestine, &c.; for in the latter case, *sublata causa, tollitur effectus.*

As the depletion of the uterus is one of the most favorable conditions for the cure of the paroxysms, it is evident that, other things being equal, eclampsia is far more serious when it comes on at the commencement of the labor, than where it is not manifested until the dilatation of the parts is so advanced as to render a spontaneous or an artificial delivery both possible and easy. The convulsions are likewise more dangerous when manifested at an early period of the gestation; not only because the patient, in case of recovery, is exposed to fresh attacks during the remainder of this state, but also because the complete obliteration of the orifice, and the hardness and length of the cervix, will render the depletion of the womb impossible. It is unnecessary to add that, in this respect, primiparæ will be much more exposed than women who have previously borne children. The truth of this assertion has been questioned of latter time, but I am happy to find a *résumé* in the memoir of M. Wieger, which confirms it fully. Of sixty-five women at different stages of pregnancy, who were attacked with eclampsia, twenty-five died, either during the attack, or in consequence of subsequent complications. That which takes place after the delivery is the least unfavorable of all; or rather such is the opinion of Dugès; but I believe with Ramsbotham, that the prognosis would then be much more serious. I have remarked, says the latter, and here again I agree with him, that when the convulsions come on in the last stages of labor, and continue after the delivery, the woman generally dies; but if they are arrested by the delivery, they seldom return, and the gentle slumber which then succeeds is the signal of a prompt convalescence.

The course and intensity of the symptoms of a convulsive attack greatly influence its termination: thus, when the paroxysms are numerous and violent, and follow each other in quick succession, more particularly if the comatose state is prolonged during the whole interval that separates them, and when the patient does not recover the use of her sensorial and intellectual faculties in this interval, the prognosis is exceedingly unfavorable, for death most usually results.

Again, it must not be supposed that all danger is over when the labor is terminated and the convulsions have altogether disappeared; for according to Denman, Collins, and others, the patients are then much exposed to consecutive abdominal inflammations, which, as is well known, often compromise their existence.

After the complete cessation of the accidents, the albuminuria is generally found to disappear rapidly, so that sometimes no traces of it remain at the expiration of four or five days subsequent to delivery.

This circumstance is a happy one, since it justifies the expectation of a happy convalescence. But if the urine remains charged with albumen for ten or fifteen days after the termination of the eclampsia, a return of the accidents is to be feared, as I once observed, on the fifteenth day; or else it may be dreaded lest the alteration of the secretion might be due to a more advanced degeneration of the kidney, which of itself would be likely to endanger the woman's life.

If the prognosis is grave as regards the mother, it is at least equally so for the child, since it very frequently dies during the convulsions that take place in the course of the gestation or at the commencement of parturition; for the disorder created in the maternal circulation must necessarily affect that of the fœtus. The latter may be affected with fatal eclampsia in the womb. I have sometimes seen it present a contracted state of all the muscles of the limbs, immediately after its expulsion; nor is it necessary to the production of the latter condition, that the mother's convulsions should have lasted for a long time. I saw (October, 1846) a highly infiltrated primiparous female, in whose case the complete dilatation of the cervix and powerful expulsive pains gave promise of a speedy delivery, notwithstanding a slight contraction of the pelvis, suddenly seized with an attack of convulsions. I applied the forceps immediately, and the child, whose heart was beating a few minutes before, was extracted without difficulty. It was dead, and the upper and lower extremities, those of the right side especially, were strongly contracted. The biceps muscles were extremely hard. M. Prestat mentions a nearly similar case.

Although the fœtus may escape the dangers to which the convulsions expose it whilst still within the womb, it is not yet entirely safe, for it is subject to a sort of hereditary influence, during the early part of its existence, which renders it liable to convulsions similar to those with which the mother was affected. Schmitt (of Paderborn) relates, that a woman in whose case an attack of eclampsia assumed for more than three hours the appearance of decided catalepsy, was delivered by the forceps of a living child. At five o'clock of the next day, the latter presented symptoms of catalepsy resembling precisely those of the mother, and died in spite of all that could be done.

But these are not the only dangers to which eclampsia exposes the child, for it is evident that version or the application of the forceps, which is then so often necessary, always endangers its existence more or less. Thus, of fifty-one children reported by Merriman, thirty-four were still-born, and seventeen were born alive; which statement, unfavorable as it is, proves at least that, contrary to the opinion of many accoucheurs, the child is not always lost; and that we should not regard its life as worthless in those cases in which the intervention of art becomes requisite.

Notwithstanding the gravity of the general symptoms of eclampsia, its effect upon the progress of gestation is not always so disastrous, for it has been known to continue in spite of long and frequent attacks. Generally, however, abortion or premature labor is the result, and that, whether the child be living, or whether it has perished in consequence of the violent shocks experienced by the mother.

However severe the attack may be, it is very unusual for the woman to die undelivered, unless the expulsion of the fœtus be prevented by a mechanical obstruction. Still, sudden death has several times been known to take place, four cases of the kind being mentioned by M. Wieger as having occurred in the practice of German accoucheurs. The Cæsarean operation was performed upon the bodies.

§ 6. PATHOLOGICAL ANATOMY.

Thus far, *post-mortem* examinations have thrown no light on the nature of eclampsia, for most usually this disease leaves no appreciable anatomical lesion behind. Often, indeed, there is a little serosity found in the ventricles or arachnoid cavity, and possibly a more or less evident congestion of the encephalic vessels; and when the affection has terminated in apoplexy, the dissection has exhibited either an apoplectic extravasation into the cerebral substance, or else a free effusion on its surface. But these are evidently nothing more than secondary lesions, the effects, and not the cause, of the convulsions.

In a woman who died from puerperal epilepsy, M. Prestat found a little body, of a stony consistence, and about as large as an ordinary pea, in the corpus striatum of the right side; and, in another case, M. Baudelocque detected an ossification of the dura mater. But M. Prestat was certainly correct in regarding such anatomical lesions as mere coincidences, for nothing would warrant the conclusion that a relation of cause and effect exists between them and the convulsions.

What we have stated in regard to the almost uniform coincidence of albuminuria with eclampsia, and to its common connection with lesions of the kidneys, sufficiently indicate that the anatomical lesions are hereafter to be sought for in those organs. For our own part, we have never failed to do so for the past ten years, nor do we hesitate at the present time to consider albuminous nephritis as one of the most common lesions after puerperal convulsions. As already stated, the kidneys have almost universally presented the anatomical characters of nephritis, the more or less advanced degrees of which appeared to coincide with the chronicity and abundance of the albuminuria.

Other observers, amongst whom I might mention MM. Blot and Depaul, state that usually they have met with no disease of the kidney, and regarding the above-mentioned facts as altogether exceptional, insist that in the majority of cases Bright's disease has no connection with eclampsia.

In the first place, I would call attention to the fact, that I do not regard Bright's disease as residing in the lesion of the kidney exclusively (page 491); and that although the kidneys should present nothing abnormal, the alteration of the urine is sufficient to prove its existence. I might, therefore, strictly pay no regard to the facts mentioned by my opponents; but let us examine whether, independently of the opinion which I support, the observations of MM. Blot and Depaul are of much value. They have found nothing, say they; but perhaps their not having done so is their own fault in not having examined sufficiently, and I have to acknowledge that hitherto I had committed the same error. Works recently published in Germany show, in fact, that the naked eye is entirely incompetent to detect anatomically the commencement of albuminous nephritis, and that the first degrees of renal alteration can be discovered only by the microscope.

The nature of this book does not permit me to enter into the anatomical and microscopic details found in Frerichs' work; but the researches of which I speak evidently show the small value of observations in which the microscope has not been employed. All negative facts should, therefore, be regarded for the moment as having no existence, and more accurate observations are necessary to determine whether or not there are cases in which the lesions of the kidneys are altogether wanting.

Henceforth, therefore, attention should be especially directed to the kidneys.

§ 7. NATURE OF ECLAMPSIA.

As a consequence of the labors of those modern pathologists who have followed the impulse given by M. Rayer, eclampsia, which had been so long classed with the neuroses, that is to say, with diseases whose nature is entirely unknown, begins to be better understood. Whoever shall have read attentively what we have said of puerperal albuminuria (page 492), and of its relations with eclampsia (page 792), will perceive that we can no longer withhold our opinion as respects the nature of puerperal convulsions.

In the first place, let us return to what we regard as the fundamental fact, which must decide the whole question, namely, that eclamptic females are almost always affected with albuminuria. Now, the presence of albumen in the urine during the puerperal state, always denotes a general alteration of the urinary secretion. This alteration, as stated (page (492), first consists in a modification of the elements of the blood, which is soon complicated with a lesion of the kidneys, constituting its anatomical expression, as albuminuria and still later eclampsia are its symptomatic expression. Eclampsia is, therefore, the ultimate phenomenon of Bright's disease, whether it be merely a general affection or more especially localized in the kidneys.

It is positively shown by clinical observation that a very close connection exists between albuminuria and eclampsia. It becomes, then, a very important matter to trace back this connection from the latter to the former; and here it is that the theory of uræmia comes in, as explained in another part of this work, to which we refer the reader. (See page 498.) We confess, however, that the pathological assumptions there taken are far from being firmly established, and that the true explanation may be yet unrevealed; at all events, the fact remains that there does exist a relation of cause and effect between albuminuria and puerperal convulsions.

MM. Blot, Depaul, and some others, having raised several objections to this opinion, we shall next endeavor to appreciate their value.

"1. As albumen is not discovered in the urine of all pregnant women, therefore eclampsia is not necessarily connected with albuminuria and Bright's disease."

Supposing the observations upon which this first objection is based to have been well made, and some of them, at least, seem to me deserving of all confidence, they still do not prove incontestably what is desired. Albumen, indeed, is not found invariably in all individuals who, not being in the puerperal state, are certainly affected with albuminous nephritis; although very abundant at certain periods, it diminishes greatly at others, and sometimes even disappears entirely for a longer or shorter time, but only to return again rather later. These same intermissions may also be met with during pregnancy; and we may readily imagine that unless the urine of the same woman who afterwards was attacked with eclampsia, had been examined frequently and through a long period, it could not be concluded that she was not albuminuric, especially if the albumen should appear during the convulsive attack.

Furthermore, facts have been observed by Mazoun, a Russian physician, and referred to by M. Imbert-Goubeyre, which appear to me to answer the objection still more completely. Mazoun mentions three cases in which the autopsy disclosed,—once, the anatomical type of the second degree of Bright's disease; once, a lard-like condition of the kidney; and once, the characters of the first degree of Bright's disease; yet, although the patients were observed daily for several weeks, albumen was never detected in their urine. Unless we admit that the fatty kidneys did not mark a case of Bright's disease, it must be allowed that this disease may exist exceptionally without albuminuria. I myself witnessed a case of the same character, which was afterward published by my colleague and friend, Dr. Fournier, in his thesis for the *Concours*. Now, if this is so, what can be concluded from those rare cases in which the eclampsia was neither preceded nor accompanied by albuminuria?

"2. When the kidneys present no alteration at the autopsy, can it still be said that the eclampsia was the consequence of albuminuria?"

I have already replied to this objection affirmatively, if we regard, as always should be done, the general alteration of the fluids, and also if the microscope has not been employed, for it alone can now enable us to say that no real alteration exists.

"3. The difficulty and rarity of the cures of Bright's disease are well known; how, then, if puerperal albuminuria is due to the same cause, explain the prompt disappearance of the albumen after delivery, and the rapid recovery of the patients?"

It is true that the albuminuria disappears quickly in a certain proportion of cases; but generally in those cases no eclampsia had taken place, or, at least, the patients recovered. Here, as was stated, it is probable that the blood was but slightly altered, and that the active or passive congestion of the kidneys produced by the obstruction to the venous circulation, contributed to a certain extent to the production of the albuminuria. We can then readily imagine that, one of the causes being removed by the delivery, the other might be incapable of maintaining the functional disorder; but it is not true to say that in other than these favorable conditions, the albuminuria ceases in a few hours. I have already quoted the statistics of M. Imbert-Goubeyre, from which it evidently follows that when the disease proves fatal, the albumen continues to the end; and that in a certain number of cases, which will probably be found to increase when the patients shall be followed more carefully, it passes into the chronic condition. I might add with M. Wieger, that the medium duration of the albuminuria in the non-fatal cases is from eight to ten days after delivery.

We see, therefore, that these objections have no great force, and are not of a character to invalidate the many good reasons which go to support our opinion.

We do not wish to deny absolutely the possible occurrence of *apparently eclamptic* convulsions, in the case of a woman in labor, who presents neither albuminuria nor any of the symptoms of Bright's disease. On the contrary, we believe that in some very rare cases, the reflex irritation produced by an extremely painful labor, or the violent congestion of the veins of the spinal column, occasioned by the extreme efforts of the woman, may over-excite the spinal marrow and give rise to partial or even general convulsions.

But we regard such cases as altogether exceptional, and would even be disposed to debar them from the title of eclampsia, and consider them as simple convulsions, hysterical or otherwise, in their nature. Such, at least, is the impression left upon us by the two cases of the kind which have come under our own observation; and the reading of the published cases inclines me to believe that most of them were not instances of real eclampsia.

§ 8. TREATMENT.

The management of eclampsia must necessarily be divided into the preventive and the curative treatment.

1. *Preventive Treatment.*

We have dwelt sufficiently upon the etiology of eclampsia to show the importance which we attach to albuminuria, or, rather, to the disease of which it is the symptom. The presence of albumen in the blood of a pregnant woman is the indication of a marked predisposition on her part to puerperal convulsions, and the best preventive treatment would be that which would result in the most favorable alteration in the condition of the blood, or in the amelioration of the renal affection which is the apparent cause of the albuminuria. Unfortunately, all the therapeutic measures employed hitherto in other conditions than the puerperal, have been very unsatisfactory. The tonic treatment, however, has seemed in some cases to be sufficiently useful to encourage new trials, especially during pregnancy, in which, as we have seen, the diminution of the albumen is attended by a lessening in the amount of all the solid principles of the blood. I would, therefore, have no hesitation in recommending the animal diet and the administration of iron, in cases of albuminuria complicating pregnancy.

The recent investigations of M. Mialhe, which prove that an excess of water in the blood is one of the most active causes of albuminuria, are evidently calculated to confirm us in the therapeutic course which we have recommended for a long time.

But, as we have already observed, convulsions almost never appear in a pregnant woman with albuminuria, unless some accidental circumstance, so to speak, should happen to excite them. They are usually connected with cerebro-spinal congestions, themselves occasioned by fortuitous circumstances, with serous plethora, or the mechanical obstruction to which the venous circulation is subjected during gestation and labor; therefore, the first object should be to prevent this congestion. On this account it is that bleeding should have the precedence of all others as a preventive measure. It should be practised several times during the latter months of pregnancy in such women as may present some of the symptoms of cerebral congestion;[1] it might also be practised with the happiest success in œdematous females, more particularly when the precursory phenomena of eclampsia shall be manifested. In the latter, we should also resort to the measures calculated to diminish the volume of the parts distended by infiltration; such as derivatives to the intestinal canal and urinary passages, the application of compresses steeped in cold water, or some aromatic decoction, and to punctures with the lancet. Nervous and irritable women, of a dry habit, will also be benefited by a moderate bleeding from the arm, and by lukewarm baths, repeated frequently during the latter months of pregnancy; and they should avoid all acute moral emotions, &c., with the greatest possible care.

---

[1] By way of showing the importance of venesection as a preventive measure, Dr. Dewees relates the following case: Mrs. ——, pregnant with her first child, was seized with frequent headaches towards the end of her gestation; she neglected to be bled, and was attacked with severe epileptic convulsions at the onset of labor, from which, however, she recovered. During her second pregnancy she was bled freely, and delivered without accident. In the third and fifth, venesection was not resorted to, and they were attended with convulsions; whilst, in the other gestations, she had recourse to this remedy, and was safely confined.

Reserve is called for in the use of diuretics, for, although they are useful in certain cases, they may, in others, affect the progress of the disease unfavorably. Generally speaking, when there is no diminution in the amount of urine excreted, they should not be employed, for the increased urination would augment the waste of albumen, and consequently the impoverishment of the blood. When, however, the patient passes but little urine, it is important to increase the secretion, in order to prevent an admixture of the principles of the urine with the blood, and thus lessen the chances of uræmic intoxication. The preparations of squill, digitalis, juniper, &c., may then be used with advantage.

After venesection and purgatives have been tried, Drs. Collins and Johnson highly extol the use of tartar emetic, administered in such a way as to nauseate without producing vomiting. For this purpose, a tablespoonful of the following mixture is given by the mouth every half hour:

℞.—Tartar emetic, ...	gr. vj.
Laudanum, ...	gtt. xxx.
Simple syrup, ...	fʒijss.
Infusion of pennyroyal, ...	f℥iij.
F. M.	

The quantity of tartar emetic is increased or diminished according to the intensity of the symptoms, and the imminence of the disease. The same potion is also strongly recommended as a curative measure, after the invasion of the convulsive attack.

[Although it cannot certainly be known that the paroxysms of eclampsia will cease immediately upon delivery, it is nevertheless true that they then do very often diminish in frequency, and at last subside altogether. This fact explains the unanimous opinion of accoucheurs that delivery is a favorable event during an attack of convulsions. The question, therefore, arises, would it not be proper to induce premature labor, for the purpose of arresting the albuminuria of pregnancy and preventing a possible attack of eclampsia? The question, when entertained, has almost always been decided in the negative. Cases, in fact, are not wanting which go to prove that after proper treatment, especially bleeding, the albuminuria may subside, and that convulsions even, after having occurred, may cease, allowing the pregnancy to continue its course, and end with a favorable delivery at term. Considerations of this character, together with the observation that women affected with severe albuminuria have not been attacked with convulsions, intimate that the question of premature labor, as a preventive, is one which should be approached very carefully. Admitting all this, we still think that there are some exceptional cases in which premature labor, artificially induced, might be of advantage. Let us suppose, in the first place, that a woman eight months pregnant, affected with albuminuria, and threatened with eclampsia, should have labor to come on prematurely and spontaneously. It is very certain that the latter circumstance would, by most accoucheurs, be regarded as favorable, and that nothing would be done to arrest it. Conceding this, we are not very far from accepting the idea of the induction of premature labor. It must not, however, be supposed that convulsions will only occur when the labor comes on, and that then their occurrence will be almost inevitable. On the contrary, it often happens that the patient is attacked with eclampsia before the end of gestation, and the labor ensues; in which case the prognosis is the less unfavorable in proportion as the labor is the farther advanced.

On all these accounts we think that the induction of premature labor in such cases ought not to be absolutely discarded, but would require as a justification for its proposal a conjunction of the following conditions: 1, that the eighth month of gestation should be fully accomplished, in order that the child might live without encountering too great risk; 2, that the albuminuria should be severe, or the patient experience some precursory symptoms of the attack of convulsions; 3, that it should be a first pregnancy, or else that the patient should have had convulsions during a previous labor; 4, that medical treatment, especially bleeding, should have been proved to be useless. Under these circumstances, premature labor, artificially induced, seems to me rational, and I do not hesitate to say that I would be disposed to have recourse to it unless subsequent facts should prove the fallacy of my present opinion.]

During parturition, the accoucheur should endeavor to modify or prevent the influence of the various causes of dystocia; thus, if the contractions assume the character of irregular, tetanic pains, he must attempt to restore them to their normal and regular type, by a resort to bathing, to the opiates, or belladonna, and to venesection; for it is an ascertained fact that the excessive agitation produced by these pains is often the forerunner of eclampsia in a nervous and irritable woman.

It were hardly necessary to call attention to the favorable effect that inhalations of chloroform might have under these circumstances, both by changing the character of the contractions, and diminishing the irritability of the nervous centres.

At the very commencement of the labor, the precaution should be taken to empty the bladder and large intestine, and to relieve the stomach of indigestible food, which might have an unfavorable effect, by vomiting.

All these measures are particularly indicated when the patient under care had previously suffered from convulsions in her former labors, for she is by that very fact predisposed to a return of them.

After the delivery, the accoucheur might often prevent this accident by carefully exploring the state of the womb subsequent to the expulsion of the child and placenta; and by assuring himself that it is well retracted, and that it contains no foreign bodies, such as coagula, or portions of the membranes or placenta.

2. *Curative Treatment.*

The curative treatment consists of the general measures that are applicable in all cases, and of the special means, which necessarily vary according to the period at which the puerperal convulsions are manifested.

A. *General Measures.*—At the head of the list of curative means we must place sanguineous emissions, which have been resorted to under every form. To these, therefore, we must first have recourse; but, in the employment of this remedy, several questions, that are important in a practical point of view, are presented for solution. Ought we to employ general or local bleeding? And, if general, which vein is to be opened? And what quantity of blood should be drawn?

["After having tested myself," says M. Depaul, "and seen tested by others, the various modes of treatment recommended for eclampsia, I have no hesitation in expressing as my conviction that venesection should be regarded as of primary value. The bleeding should, however, be carried so far as to withdraw from the patient, in the course of a few hours, thirty-two, forty-eight, or sixty-four ounces of blood, according to circumstances and the effect produced."]

In a large majority of cases, general venesection will first be preferred; and the revulsive application of leeches or cupping will only be resorted to in those instances where the convulsions shall have followed a profuse hemorrhage. Where free bleeding has been practised, and the coma continues, notwithstanding, throughout the whole interval between the fits, thus announcing an intense congestion about the encephalon, we might apply leeches with advantage to the mastoid processes, or to the neck, and also, perhaps, around the malleoli.

Writers have sharply discussed the question as to what vessels should be opened; and arteriotomy in the temporal, bleeding in the arm or foot, and opening the jugular vein, have been extolled in turn. The advantages of blood-letting are very nearly the same, whichever vessel be opened; and, consequently, as venesection in the arm is by far the most easy, and as we can always obtain there as much blood as may be deemed advisable, this is usually practised, and, as a general rule, should be preferred.

It is very important that the vein should be opened largely, and that the blood should flow in a full stream. Should it dribble away, or the jet be very small, the bleeding, Ramsbotham says, is almost useless, and another vein had better be opened at once.

The quantity of blood to be drawn varies according to the patient's constitution, the violence of the paroxysms, &c., &c.; thus, in lymphatic individuals, we should, as a general rule, be satisfied with the extraction of fourteen to eighteen ounces; and if the symptoms still continue after this, and it be deemed necessary to keep up the sanguineous emission, it ought to be confined to the application of fifteen, twenty, or thirty leeches behind each ear.[1]

In plethoric women, after a copious bleeding of sixteen ounces, a second, of ten to fourteen ounces, might be resorted to, two or three hours afterwards, and perhaps even a third; but a fourth is rarely admissible, and we would preferably apply, instead, either leeches to the mastoid processes or cups to the back of the neck.

Bleeding has the double advantage of removing the congestion or irritation of the spinal marrow, and of preventing at the same time the cerebro-spinal congestion, which takes place during the fit, and which may produce fatal disorders, or at least become indirectly the cause of a fresh attack.

---

[1] The reader will bear in mind that the leeches directed in the text are of the European variety, which extract a much larger quantity of blood than our own.—*Translator.*

General bleeding, even when carried so far as to weaken the patient greatly, does not surely prevent congestion of the brain or even effusion; for all these anatomical lesions have been observed in women who died after profuse bleeding by the lancet. On the other hand, when carried beyond certain limits, it may become itself the occasion of a fresh excitement of the spinal marrow, as is observed after all great hemorrhages, which almost always end in convulsions. The particular object, in applying leeches or cups to the nucha or behind the ears, is to supply the insufficiency of venesection, or to avoid any unfavorable effect which the latter might possibly have.

Though the gravity of the symptoms, and the fear of congestions and effusions in the brain and spinal marrow, may often call for bleeding, it should not be forgotten that the impoverishment of the blood of most eclamptic patients contra-indicates a too abundant loss of blood. It is proper, therefore, to bleed sufficiently to remove the congestions of the nervous centres or lungs, and to prevent apoplectic effusions, but going too far in this direction would involve the most deplorable consequences.

Simultaneously with the venesection, it is advisable to produce a salutary derivation to the intestinal canal and skin.

[We have already mentioned, under the head of *Preventive Treatment*, that Drs. Collins and Johnson had recommended the use of large doses of tartar emetic. When given in the style of Rasori, Dr. Legroux has found it to have a good effect even in cases of confirmed convulsions, and I had the same experience in one severe case. Unfortunately, however, this favorable result does not always follow.]

I think that, as a rule, emetics ought not to be given during the attack, being calculated to augment the convulsive movements and cerebral congestion by the retchings they determine; still, if there was good reason for supposing that the accidents were partially caused by the pressure of badly digested food in the stomach, vomiting should be encouraged either mechanically, by tickling the throat, or by the administration of an emetic.

Purgatives are much to be preferred, especially when the large intestine is filled with hardened fecal matters.

If the patient recovers her intelligence during the intervals, and she can be induced to swallow, we might exhibit castor-oil by the mouth in the dose of one or two ounces; or, still better, two grains of calomel every quarter of an hour, until it produces a purgative effect. If, on the contrary, she cannot swallow, a plan advised by Merriman might be adopted; that is, to put the calomel mixed with *moist* sugar in equal proportions between the lips and alveolar arches, or, if possible, into the mouth, and renew it until several stools are procured. If this latter measure be ineffectual, it will be requisite to act on the lower part of the intestinal canal by administering injections, rendered purgative by the addition of an ounce and a half or two ounces of castor-oil, or of the miel mercuriale, and, if necessary, by incorporating with it a few drops of croton-oil.

The fact that extreme distention of the bladder has occasionally appeared to be the determining cause of the attack, should always lead us to ascertain the condition of that viscus by percussion, and to use the catheter if it should chance to be found distended.

There are yet some other measures that cannot be relied on when employed alone; but which, nevertheless, are too important to be neglected. We allude to sinapisms applied successively on the thighs, calves of the legs, and feet, to vesicatories, and to dry cups placed on the back of the neck, and on the lower extremities. I apply them, says M. Velpeau, to both thighs and the nape of the neck, so that they may act whilst we are engaged with the blood-letting, blisters, or leeches.

They have appeared to me, remarks M. Prestat, particularly useful in œdematous women; only it is necessary to watch their effects for a few days afterwards, lest their surface becomes gangrenous.

I place an application of the large cups of Dr. Junod[1] to the lower extremities in the first class of revulsives, as being the most powerful and prompt in their action of any. In a case of eclampsia, that occurred five hours after delivery, the symptoms lasted for thirteen hours; and the patient's condition became more and more dangerous, notwithstanding the employment of all the measures just spoken of. At the first application of these cups, the convulsive paroxysms disappeared; at the second the coma became less profound: and at the third, the patient regained her intelligence. In three other cases, the effect was not so rapid, although they appeared to have a favorable influence.

These cups are especially applicable when, notwithstanding large general bleedings, the application of leeches or scarified cups has failed to remove the symptoms. Under these circumstances, they have the immense advantage of opposing the cause which seems to drive the fluids towards the brain, by keeping a large amount of blood in the lower extremities.

Cold aspersions upon the face and chest, and tickling the nostrils, have sometimes had the effect to render the inspirations more easy and perfect, and thus defer the attack of convulsions. Harvey relates the case of a woman in labor, who was awakened from a deep coma by tickling the interior of the nostrils. Denman gives the history of a lady whose every pain was attended by a convulsion, until he put an end to the latter for the rest of the labor, by sprinkling the face at the beginning of each contraction by means of a feather dipped in cold water. Even if useless, the measure is too innocent a one not to be had recourse to.

Since the use of anæsthetics in obstetric practice, some accoucheurs have thought it right to employ inhalations in the treatment of eclampsia. Calculating upon the power of ether and chloroform to destroy the action of the muscles of animal life, they hoped that they might act in the same way upon the involuntary and spasmodic contractions resulting from puerperal convulsions.

Reasoning *a priori*, we were inclined to disapprove of their employment in a disease so often complicated with congestion of the brain, and even apoplexy, and were not, perhaps, free from prejudice, thus derived, in reading and analyzing most of the published observations. In the last edition, we, therefore, proscribed their use in the majority of cases, except when the beginning of the convulsion seemed due to some local irritation of an organ whose extreme sensitiveness awakened the reflex action of the spinal nerves. Other facts published by several colleagues as well as the result of personal observation, have greatly changed our first opinion, so that we are now convinced that when eclampsia comes on during either pregnancy or labor, and the closure or undilatability of the cervix makes it impossible to effect delivery, or when the attacks, having resisted bleeding and revulsives, are very frequent, and by their steadily increasing severity threaten the lives of both mother and child, then, we are convinced, the use of chloroform may be of some service. In two cases we found it to suspend the attacks completely. In one of these cases, two bleedings, purgatives by the mouth and rectum, &c., had been employed without advantage. The cervix was insufficiently dilated, and at 5 A.M. I used the chloroform, repeating the inhalations at the beginning of each pain, and continuing them until 9 A.M., at which time I was able to apply my forceps. Not a single attack occurred during this interval. After delivery I thought it right to stop the inhalations, and the woman became partly sensible. Some fruitless attempts were made to extract the placenta, and when, an hour after the birth of the child, it was brought away, another convulsion occurred. I immediately resumed the chloroform, and the attack was not repeated; short inhalations, however, being made during the hour succeeding. Both mother and child came out safely from the fearful trial. I might borrow similar cases from the theses of M. Blot and others, but will not dwell further upon this point, reserving its more detailed treatment for the chapter devoted especially to the study of anæsthetics in obstetric practice.

---

[1] The apparatus of Dr. Junod consists of a large metallic boot, capable of receiving the greater portion of a lower extremity. The upper part of the boot is so adapted to the limb as to prevent the ingress of air, and a partial or complete vacuum is obtained by the use of an air-pump.—*Translator.*

Such are the measures that ought to be primarily employed; but there are certain others which, without having the same efficacy, may however prove very useful. For instance, when the intervals between the attacks last for an hour at least, and during all this time the patient has recovered her senses, it is advisable to place her in a lukewarm bath, and whilst she is there, to keep compresses, steeped in some iced liquid, constantly applied on her head. This application of cold should be kept up throughout the whole duration of the attack; this measure has often seemed in our hands, says Madame Lachapelle, to second the venesection beneficially. It is particularly useful when a febrile coma succeeds the eclamptic paroxysm; as also when the occurrence of delirium announces the commencement of a cerebral fever.

The antispasmodics recommended by M. Velpeau in the hysteric form of eclampsia, that is to say, in the hysteria of pregnant women, appear to me useless in most cases of puerperal convulsions; and it would only be as a preventive measure, or else in a very slight attack, that they could be resorted to with benefit; besides which, we should lose precious time by depending on them in these grave cases.

Compression of the two primitive carotids, which has recently been proposed as a remedy for most convulsive affections, has been successfully practised in some cases of eclampsia; and hence it constitutes another measure to which we might recur, without, however, attaching too much importance to its action, for it has failed in several instances. (*Journal de Trousseau*, Nov. 1840, p. 186.)

In my estimation, the opiates ought to be wholly banished from the treatment of a disease which so often terminates in cerebral congestions, at least whenever the condition of the patient is such as to allow of the abstraction of blood; but in the case of an anæmic female, or of one who has already been bled very freely, opium, by acting as a sedative to the nervous centres, might perhaps be productive of some advantage.

During the paroxysm, the necessary precautions must be taken to restrain the patient's dangerous movements; but it is not requisite to employ violence for that purpose, as some persons advise; for we have elsewhere stated that there is scarcely any tendency to change the position; and it will be quite sufficient to merely watch over her, without endeavoring to prevent the convulsive movements, the intensity of which might thereby be augmented.

Particular care is requisite to prevent the tongue from being bitten, since it is very liable to be pushed beyond the alveolar arches, and often becomes wounded by the convulsive contraction of the masseter muscles. To prevent such an accident, it has been advised to place some hard body, the handle of a spoon, for instance, between the teeth, so as to hold them apart; but Madame Lachapelle says this is an almost infallible way of breaking the incisors. Gardien directs a piece of cork to be put between the molars instead, as it would not be attended with this inconvenience; but this might escape from the fingers, and be drawn down, by an inspiratory movement, into the opening of the glottis, and thus suffocate the patient. A much more simple plan is to push back the tongue behind the alveolar arches with the fingers themselves, at the commencement of each fit; when, the jaws being once closed, the tongue can no longer protrude; it may be contused between the teeth, but that is all. Besides, this little operation may easily be explained to the assistants, who perform it without difficulty, as soon as they have overcome the chimerical fear of being bitten.

[A still more simple method has been, for a long time, in use at the Hospital of the Clinic. It consists in stretching tight between the two hands eight or ten inches of the edge of a towel, and applying it upon the dorsum of the tongue, at the same time pressing it strongly back into the mouth. The jaws are then free to close upon the linen without inconvenience to the patient or risk to the assistants. When the paroxysm subsides, the towel may be removed.]

B. *Special Measures.*—The course pointed out thus far might be considered as the medical part of the treatment of eclampsia.

But when, notwithstanding the employment of these means, the convulsions continue and increase in violence, what is to be done? The pregnant condition being the first cause of eclampsia, it was natural to expect to find the most effectual remedy in the evacuation of the uterus. Such, indeed, is the opinion of almost all practitioners, and it was also our own, until within a few years past. Since, however, we have so often seen the convulsions continue for several days after the spontaneous expulsion or the ext of the fœtus, we have far less confidence in the immediate results of the cessation of pregnancy. As we have already said, the principal cause of eclampsia is to be sought for in a general alteration of the economy; now, although this modification is due to the course of gestation and sustained thereby, it is impossible that it should disappear immediately upon delivery. It remains for a longer or shorter time, and the woman returns but slowly to the normal state of the unimpregnated condition. Although lessened, it may still exert its influence, as is proved by the occasional occurrence of attacks several hours, and sometimes even several days, after delivery. To empty the uterus is, therefore, to attack but one of the remote causes of eclampsia, by no means the immediate one. Notwithstanding all these limitations, we do not reject absolutely the induction of premature labor, but will state hereafter the circumstances under which we think that it would be right to employ it.

In order to explain our view thoroughly, we shall examine successively the indications afforded by severe eclampsia, according to whether the convulsions are manifested in the course of pregnancy, or during parturition, or subsequent to the delivery.

1. *During the Gestation.*—Prior to the seventh month, that is to say, before the period at which the fœtus is viable, the treatment should be purely medical.

At a more advanced period two very different cases may present; that is, either the uterine contractions are prematurely and spontaneously developed under the influence of the general convulsions, or the womb remains entirely apart from the general disorders produced by the eclampsia. In the former case the labor has commenced, and we shall treat below of the means to be then employed, upon which most accoucheurs are agreed; but, in the latter, the proper course to follow is far from being so clearly marked out. The question naturally arises, what then is to be done, supposing the eclampsia has resisted venesection, the intestinal and cutaneous revulsives, etc.; and supposing that the patient has arrived at the eighth or ninth month, and the labor has not commenced, but still the convulsions continue and threaten the mother's life?

[Induced labor and forcible delivery have both been recommended under these very serious circumstances. In regard to the first, it may be said that the measures commonly employed to excite uterine contraction, act too slowly to be used in cases in which we suppose the life of the patient endangered by convulsions which have already lasted for a long time, and against which all therapeutical resources have been exhausted.

Premature artificial delivery has, therefore, had but few partisans, because it requires considerable time, whilst eclampsia pursues its course rapidly, so that its termination by recovery or death will have taken place before delivery can be effected.

This condemnation has not, however, been universal. Chailly, Krause, and many others have succeeded, and do not hesitate to advise it. It is also fair to state that we are now in possession of means for bringing on labor very rapidly, (see *Premature Artificial Delivery*,) which is a consideration that ought to incline the balance in favor of active intervention. Inasmuch as the chances of success are certainly very small, we think that induced labor ought to be reserved for cases in which the disease progresses notwithstanding the use of copious bleeding and other allied measures.]

There are certain females who are subject during pregnancy to repeated attacks of convulsions at variable intervals, and in whom, also, each fresh attack is more serious than the preceding. The recurrence of these attacks every eight days or two weeks, compromises increasingly the life of both mother and child, and we might reasonably fear lest another should prove fatal to both individuals. Now, although we have rejected the provocation of labor during the attack itself, we think it proper in the cases just mentioned, but it should be practised only in the intervals of the convulsive paroxysms.

Forcible delivery would seem likely, by emptying the uterus at once, to afford some chance to the patient.

But at a period still quite distant from term, the length of the neck, and the resistance of its unsoftened internal orifice, would render the forcible introduction of the hand very difficult, and the efforts required to penetrate within the womb are very likely to excite, to irritate the organ, and consequently, to increase the general convulsions.

These resistances, and the general irritation which they produce, are so great in most cases, that efforts have been made to overcome them by making numerous incisions around the circumference of the cervix. Doubtless, when the neck is effaced either by the progress of gestation or by premature contractions, these incisions may be useful and harmless, since they are practised upon the intra-vaginal portion of the neck only; but in the eighth month, whilst the neck retains its entire length, the greatest difficulties are presented at the internal orifice and upper part of the cervix. To incise the external orifice, would remove only the least resistance, and I think that no surgeon would have the temerity to apply a cutting instrument to the internal orifice. I have yet no experience in such cases, but am convinced that when the incisions have been successful, it has been in cases of far advanced pregnancy, or when unobserved contractions had dilated the upper part of the cervix. This, happily, is what takes place in most cases of long-continued convulsions, but which we exclude from the supposed conditions.

Admitting, however, that a forcible introduction of the hand, whether preparation have been made or not by incisions, can be effected without much difficulty, it must not be supposed that the extraction of the fœtus is unaccompanied by danger. We have supposed the uterus to be inert; now, although the irritation produced by the hand of the accoucheur and the movements impressed upon the fœtus during its extraction, are calculated to excite contractions, is there not cause to fear lest inertia of the organ might result from this too rapid depletion, and become the source of fresh accidents?

If, finally, after having overcome all these difficulties, we were sure that the eclampsia would cease, I could understand how such an operation might be undertaken; but as experience proves the contrary, I think that during pregnancy, however severe the convulsive attack may be, forcible delivery ought not to be attempted.

2. *During Labor.*—The prompt termination of the labor so generally advised, should not, however, be practised except with a certain degree of

reserve; and for the sake of clearness in this recapitulation of the indications, we shall endeavor to solve the following questions in order:

What ought to be done when the cervix is dilated or dilatable? And what is the proper course to pursue when it is neither sufficiently dilated nor dilatable, to permit a prompt artificial termination of the labor?

a. The cervix is dilated or dilatable.—If the head has descended into the excavation and distends the perineum, or presses strongly upon the circumference of the uterine orifice, if but one or two attacks have yet occurred, and especially if there is reason for supposing that extreme sensibility of the cervix or of the soft parts, may have had any agency in the production of the eclampsia, the forceps should be applied immediately. It is under these circumstances, more particularly, that the immediate termination of the labor prevents a recurrence of the accidents.

If the eclampsia is slight, though it has lasted for a certain time, that is to say, if the convulsive attacks are moderate and the intervals between them long; and if the woman regains her consciousness entirely during the interval; if, under these circumstances, the labor is advanced, the dilatation complete, and the head of the child has passed through the orifice and descended deeply into the excavation; if the uterus contracts powerfully, and if the perineum is not too resisting, we think it right to wait for the expulsion to take place naturally.

But if, under the same conditions, the pains are feeble, distant, and inefficacious, or if the contractions are energetic, but the convulsions are frequent and prolonged, with profound coma during the interval of the paroxysms, we believe that the mother and infant should be immediately relieved from the dangers that threaten them, by the application of the forceps.

When, so far from having cleared the os uteri, the head is still retained above the superior strait, especially if the membranes are still intact, the pelvic version would in general appear preferable to an application of the forceps. (See *Forceps.*) We say that the version would appear *in general* not always preferable, for we know this is at times impracticable, even where the head is still above the abdominal strait. The almost total discharge of the amniotic liquid, and the violent contractions of the uterus, which often participates in the general convulsions, and the violent irritation that the organ has to support during the introduction of the hand and the evolution of the fœtus, sufficiently explain our reserve, as well as the preference that we accord to the forceps in this particular case.

Should the face present, and be well down in the excavation, we would likewise apply the forceps; but, on the contrary, we should have recourse to the pelvic version if it were yet above the superior strait, or even when engaged in this strait, if it happened to be in a mento-posterior position. In the presentations of the pelvic extremity, it is advisable to hasten the termination of the labor by drawing judiciously and carefully on this extremity. In the presentations of the trunk, the feet are to be brought down; for we would only have recourse to the cephalic in preference to the pelvic version, when the pelvis is greatly contracted; and when the cephalic version is resorted to, it must evidently be followed by a prompt application of the forceps, and if these should fail, of the cephalotribe.

b. What is to be done when the cervex is neither dilated nor dilatable?—If the membranes are not broken, and more particularly if the uterus appears to be greatly distended by a large quantity of water, they should be ruptured, and a discharge of the liquid and a partial depletion of the organ be facilitated, by pushing up the presenting part with the finger; for such a rupture has often proved sufficient to diminish the frequency and intensity of the convulsive paroxysms, and has justified the accoucheur in waiting for the complete dilatation of the cervix. But if the distention of the womb is not so far from normal, we think that the interest of the fœtus demands that the membranes should be respected, and spontaneous dilatation awaited; when this dilatation progresses too slowly, the ointment, or, still better, the extract of belladonna should be employed, and be smeared over both the internal and external portions of the orifice.

But, supposing the eclampsia is more serious, the coma still continues, and the convulsions have not been alleviated by the rupture of the membranes; and, moreover, the os uteri is not yet dilated, or else is so convulsively contracted as to prevent an introduction of the hand or instruments, are we, under such unfavorable circumstances, to abandon the delivery to nature, as some accoucheurs advise? Or, on the contrary, ought we to penetrate forcibly into the uterine cavity, by opening a route by violence, or a cutting instrument?

At the commencement, or even during the first four or five hours of labor, these extreme measures doubtless should not be resorted to; but when the convulsions persist, notwithstanding the employment of the most rational means; when ten, twenty, or thirty hours have elapsed since the onset of the symptoms; when the woman's life is compromised by the duration and the constantly increasing intensity of the paroxysms, our only hope is in a depletion of the uterus; a forced delivery then appears to us the sole resource, and authorized by the interest of the child even more than by that of the mother.

Two plans have been proposed for effecting this object, namely, a forcible introduction of the hand into the womb, and the division of the cervix by the aid of a cutting instrument. We shall hereafter revert to the mode of operating in both cases, when describing the difficulties that may be met with in making the pelvic version; and will therefore only remark here that, by the length of time it demands, by the excitement and irritation thereby produced (all of which are assuredly calculated to increase the convulsions), and by the lacerations to which it gives rise, however carefully it may be performed, the forcible introduction of the hand into the womb is very dangerous and ought to be rejected; and that, unless there is a very feeble resistance at the orifice to be overcome, repeated incisions, made at divers points of the circumference of the neck, ought, in our opinion, to be decidedly preferred.

But, whatever operative process be employed, the resistance from the os uteri being once overcome, the labor will be terminated by an application of the forceps, or by the pelvic evolution, according as the conditions shall be found more or less favorable to the practice of the one or the other operation; which conditions will be carefully detailed when we shall treat of version and the forceps.

Inasmuch as the expectation, recommended by us when the cervix is neither dilated nor dilatable, except in cases of imminent danger to the mother, is opposed to the generally received opinion, it becomes necessary to defend it. Although regarding in a general way the termination of the labor as a favorable condition, we are far from according to it the happy effect claimed by some authors in its favor.

In no case, indeed, in which the eclampsia had existed for a long time before we were called to the patient, have we ever found the termination of the labor to put an end to the symptoms, and very rarely did it ever lessen their intensity. The convulsions continued after delivery with the same frequency and violence as before. In three cases only have we known them to cease after the application of the forceps; but here it must be said, that having witnessed the commencement of the eclampsia, we were enabled to extract the fœtus immediately after the first attack.

If, therefore, we regard only the interest of the mother, we think that the intervention of art is justifiable only when the dilatation of the cervix renders it easy and but moderately irritating to the maternal organs; but if the fœtus is living, its life is seriously endangered by a too long continuance in the cavity of the uterus, especially after the rupture of the membranes; and since the termination of the labor, when prudently effected, does not sensibly increase the dangers to which the woman is exposed, we think that the child should be extracted as early as possible.

3. *After the Delivery.*—The only special indication, presented by the eclampsia after the child's expulsion, is to extract the after-birth and all the coagula, together with any portions of the membranes that may have been retained in the uterus; and to remove the sanious matters and detritus by detergent injections thrown up into its cavity.

But if the introduction of the hand should prove too difficult and painful, it should be withheld; for the retention of the foreign body would be much less irritating, and consequently less painful, than ill-timed attempts at introduction.

CHAPTER XIII.

OF CERTAIN DISEASES THAT MAY COMPLICATE LABOR.

INDEPENDENTLY of the various accidents just studied, which have a special relation to pregnancy and parturition, there are yet some other affections whose existence at the time of labor may render the delivery dangerous, difficult, or perhaps altogether impossible, without the intervention of art. Thus, hemoptysis, hematemesis, or an aneurismal tumor; asthma, syncope, the presence of a hernia, or the loss of strength in a woman who is enfeebled by some chronic disease, traumatic emphysema, or fracture of the sternum, may individually complicate the delivery; and, therefore, they claim the particular attention of the accoucheur.

A. *Hemoptysis; Hematemesis.*—When the patient under care happens to be affected with hemoptysis or hematemesis, and the hemorrhage is inconsiderable, there is nothing to be done; but if it does not abate, or if it suddenly augments in quantity during the pains of child-birth, we must endeavor to remove the patient from the danger that threatens her, by terminating the labor as soon as the dilatation or the dilatability of the os uteri will permit, by an immediate application of the forceps or the pelvic version, according to the particular conditions in which the parts of the child and those of the mother shall be found.

B. *Aneurismal Tumor.*—The same indications for treatment also present where the patient has a moderate-sized aneurism, more especially if it occupies one of the large vessels of the abdomen and chest. In fact, the reader must foresee how greatly the tumor would be exposed to rupture, during the violent strainings to which the woman involuntarily gives way during the second stage of labor.

Chronic diseases of the heart, whether consisting in an hypertrophy of the organ, or simply in alteration of the valves or contraction of the orifices, are but too often, as M. Aran has recently demonstrated, the cause of sudden death, not to call for some special attention during labor. It would seem to me very imprudent to allow the expulsive stage to continue too long in such cases, and I should think it right to terminate the labor artificially as soon as possible.[1]

C. *Asthma.*—The same course is to be pursued in all cases where any considerable obstacle to the respiration is found to exist; as happens in asthmatic persons and in women of small stature, in whom the uterus is so enormously distended as to press up the diaphragm and lungs towards the upper part of the chest, and in whom the respiratory functions have, on this account, been disordered during the latter months of pregnancy.

D. *Hernia.*—Where a hernia exists, every one must understand, says Desormeaux, what disastrous consequences might result from the violent throes of the latter stages of labor; and how much these tumors must then be exposed to an increase of size, and how liable they are to become strangulated. The accoucheur ought to prevent these accidents, by reducing the hernia as soon as possible, if it is reducible; endeavoring to return it during the interval between the pains; and, when the contraction comes on, he will make a strong compression over the hernial opening by his fingers, or, still better, with a convex pad, to prevent its coming down. But if it is irreducible, he should apply a convex pad, or merely support the tumor with the palm of his hand, so as to prevent the expulsion of new parts during the pain. Finally, if, notwithstanding all these precautions (which the accoucheur ought to attend to himself, unless he has an assistant upon whom he can rely,) the hernia becomes strangulated, he should immediately terminate the labor, as in the foregoing cases.

---

[1] I was requested to assist at the autopsy of a female, forty years of age, who died suddenly during labor. She was the mother of three children.

For seven years past, her respiration had been very difficult, and she coughed habitually. Both the dyspnœa and cough had increased of late, and the sputa were sometimes streaked with blood; a few hours after the membranes were ruptured, and during a pain, whilst resting one hand on the edge of a bed and the other on the arm of an assistant, she fell dead without uttering a cry. At the examination, about three pints of serum were found in both pleuræ; the lungs were healthy, but compressed; a considerable amount of fluid was also contained in the pericardium.

On another occasion, one of my pupils requested my attendance at the autopsy of a woman twenty-eight years of age, who died suddenly, immediately after the delivery of her fourth child. For three or four years past she had suffered from violent palpitations, and the slightest exertion, especially going up stairs, even slowly, put her very much out of breath; she coughed continually, and now and then spat a little blood. The labor was easy and rapid; she did not appear fatigued, and inquired the sex of her child. Whilst the accoucheur was tying the cord, he remarked a few convulsive movements, but hardly had time to run to her, before she was dead.

The uterus was firmly contracted. The abdominal viscera were healthy, as also were the lungs, though the latter were engorged with blood; the heart was small, and very flaccid; the mitral valve was much thickened, and *the auriculo-ventricular opening would barely admit the extremity of the little finger.* There were hardly five ounces of serum in the peritoneal cavity. (Francis Ramsbotham, *Obst. Med. Surg.*, p. 608.)

E. *Syncope.*—There are certain very delicate or very irritable females who are apt to fall into a state of syncope from the occurrence of the most trivial pain. In such cases, where the faintings are dependent either on a restricted diet, on a previous hemorrhage, or on some former disease, it is necessary to keep up the patient's strength by some light nutritive articles of diet, such as broth, and by a little generous wine or cordial. If these measures prove to be insufficient, and the swoonings are renewed so often as to threaten her existence, we must terminate the labor. However, this measure is not to be prematurely resorted to, for these syncopes may be owing to some trifling cause or nervous condition, without there being that extreme debility, which alone, says Gardien, can authorize this ultimate step to be taken. Desormeaux says, I have seen such faintings renewed at every pain, in a woman who was pregnant with twins; and they lasted throughout the interval from one pain to another, so that the patient was only aroused from that state by the effect of, and during the time of, the contractions; nevertheless, the labor terminated spontaneously and happily for both the mother and children.

Baudelocque gives the history of a woman who died during labor after repeated syncopes; but the autopsy proved that these latter, as also the vomitings and diarrhœa that accompanied them, had been produced, not by the labor, but by the presence of a calculus, about the size of a small nut, in the gall bladder. It is really very difficult to accept such an explanation as this, especially as so many examples of quite as sudden death are on record, of which no other explanation can be given than such as attaches to the phenomena of the labor itself.

Dr. Davis relates a much more extraordinary case of the kind: A poor woman had been five hours in labor at the Charity Hospital; the membranes were ruptured, and a large quantity of the waters escaped, but from that moment the patient became excessively feeble; experiencing an urgent desire to empty the bowels, she seated herself on the vessel, and made some straining efforts, when she fainted away; the attendants immediately placed her in a horizontal position, and they had scarcely time to get her into bed before she died. Nothing whatever was detected at the autopsical examination that could give a clue to the cause of this sudden death.

F. *Exhaustion.*—When the patients are exhausted by an antecedent disease, whether acute or chronic, and when frequent and long-continued vomiting has affected nutrition greatly, and diminished the strength considerably, I should think it prudent not to allow the expulsive stage to continue longer than an hour or two. The efforts required to terminate the second stage, might, in some cases, exhaust the remaining strength, and bring on immediately after delivery a rapidly fatal collapse.

To the cases already known I might add another. The young wife of a medical friend had been affected with such obstinate vomiting during the last three months of her pregnancy as to be unable to retain anything on her stomach. A constant febrile movement was the consequence, accompanied by nocturnal paroxysms and extreme wasting and debility. She finally reached the term of her painful pregnancy. The labor lasted ten hours in all, and the expulsive stage, during which I was obliged to be absent, four hours. Immediately after the spontaneous termination of the labor, the unfortunate lady fainted, and although hemorrhage was prevented by the favorable contraction of the uterus, she expired in three-quarters of an hour, notwithstanding the internal and external employment of the most powerful tonics.

[G. *Pulmonary and Subcutaneous Emphysema.*—In consequence of the forcible compression of the air contained in the respiratory organs during the violent efforts of labor, rupture of the air-passages sometimes, though rarely, occurs, and gives rise to emphysema.

An article upon the subject by M. Depaul lies before us whilst writing, and we shall use it, as also the more recent production by Dr. de Soyre.

Should the rupture occur in the larynx or trachea, the emphysematous swelling will appear in the neck, to which it is sometimes restricted, though at others it invades both the face and the head. Still more rarely, it spreads to the body, where it occasionally acquires an enormous size. When limited in extent, the emphysema is, so to speak, attended with no inconvenience, but when it invades the body and the limbs, may occasion oppression and threaten suffocation. I have, however, no case to report of death occurring under these circumstances, for recovery gradually takes place by absorption of the air.

When the pulmonary vesicles give way, it is, doubtless, possible for the emphysema to reach the mediastinum, and from thence spread to the neck, but the air may also diffuse itself through the intervesicular, interlobular, and subpleural cellular tissue, and thus invade both lungs, without, however, passing beyond them. In such a case, emphysema may prove rapidly fatal, as shown by a remarkable instance published by M. Depaul. The patient in question had never during life a single symptom to excite a suspicion of the existence of the slightest lesion of the respiratory organs. During the greater part of her second labor, the breathing was easy and free, but the latter stages were rendered difficult by deformity of the inferior strait and large size of the head of the child. During the powerful expulsive efforts to which the patient gave way, her respiration suddenly became short and difficult, and the pulse small and extremely rapid. M. Depaul immediately delivered her by the forceps, but the symptoms grew worse until ended by death, forty-six hours after delivery. The autopsy revealed emphysema of the cellular tissue of both lungs.

Emphysema usually demands no special treatment; should the air invade the body and impede respiration, punctures should be made with a lancet, or even incisions through the skin. As in all cases it is to be apprehended that the affection will continue to spread, should the labor be prolonged, delivery should be hastened by the use of the forceps.

H. *Fractures of the Sternum.*—It is possible for the sternum to be fractured by muscular effort during labor. Chaussier saw two cases of the kind, both occurring during the first labors of women of from twenty-four to twenty-five years of age. At the moment the fracture took place, both the patients had the head thrown back as far as possible, at the same time drawing strongly with the arms and pressing with the feet. These fractures are simple, transverse, and separate the sternum into two pieces. The symptoms are, first, sharp pain at the point of fracture; and one of Chaussier's patients heard at the same time a crack which caused her to exclaim that she had probably broken something in her breast. With this there is sometimes abnormal mobility, and occasionally even crepitation. The diagnosis is, however, often far from easy. In one of Chaussier's cases, the fracture was not discovered until the tenth day. The treatment is simply a bandage applied around the chest to prevent motion.]

CHAPTER XIV.

DYSTOCIA OCCASIONED BY THE FŒTAL APPENDAGES.

THE membranes which form the walls of the ovum, the umbilical cord, the placenta, and the amniotic fluid, may all, through some departure from the normal condition, give rise to dystocia. Thus, unusual strength of the membranes may retard labor and necessitate their artificial rupture. (See p. 396.) On the other hand, they may be too thin or tender, and thus dispose to a premature discharge of the waters, which is not desirable. (See p. 296.) Excess of amniotic fluid forms one of the true diseases of pregnancy (see p. 541), and sometimes causes the labor to be very tedious (see p. 607). Finally, by its insertion upon the neck of the uterus, the placenta is but too often the cause of alarming hemorrhage. (See p. 754, *et seq.*) All these causes of difficult labor, very different as they are seen to be, have already been studied in the various articles referred to, and will receive no further attention; but to complete the subject of dystocia occasioned by the fœtal appendages, we have, lastly, to treat of prolapsus and shortness of the umbilical cord.

ARTICLE I.

PROLAPSUS, OR FALLING OF THE CORD.

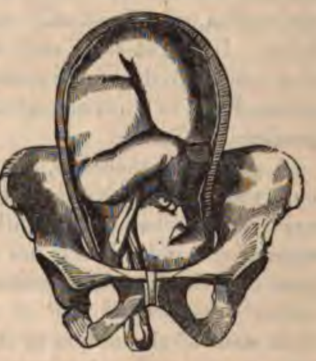
The descent of the cord is quite a rare accident, since Madame Lachapelle states that she met with it but forty-one times in fifteen thousand six hundred and fifty-two labors; but it is probable, as she appears to think herself, that there has been an error in the registers, for the statements given by other observers show a much larger proportion. I shall only bring forward the account of Michaelis, who says that he had detected fifty-four cases of falling of the cord in two thousand and four hundred labors; and a summary, by Dr. Churchill, of ninety thousand nine hundred and eighty-three labors, in which there were three hundred and twenty-two cases of prolapsus, or one in two hundred and eighty-two, nearly. (Rigby.)

The falling of the cord is most frequently observed in vertex presentations, which circumstance is readily explained by the comparative rarity of the others. But, in proportion to the relative numbers, it is more frequent in breech presentations, and far more so in those of the trunk. In thirty-three cases of labor at term accompanied by this accident, Mauriceau observed seventeen presentations of the vertex, one of the face, one of the feet, nine of the hand or arm, three of one hand and one foot, one of the breech and one hand, and one of the head and one hand. In sixteen thousand six hundred and fifty-two deliveries, Dr. Collins has met with ninety-seven cases of prolapsus, namely, twelve times in twin pregnancies (and in seven of these twelve the prolapsed cord belonged to the second child); nine times in footling presentations; twice in those of the breech; four times with the shoulder; seven times when an escape of the hand complicated a head presentation; seven with a dead and putrefied fœtus; and lastly, in three cases the delivery took place before term; that is, twice at seven and once at eight months; and the others were simple vertex presentations.

Certain authors have endeavored to draw a line of distinction between the prolapsus or presentation and the falling, properly so called; designating, under the former title, those cases in which the cord, though found in the uterine orifice, is still retained in the amniotic sac, on whose lower part it lies; and, under the latter, those cases only in which it hangs down in the vagina, or even protrudes beyond the vulva, after the rupture of the membranes; but such a distinction is puerile, as it can only serve to designate two degrees of the same accident.

A. The *causes* that may be considered as predisposing to a prolapsus are: the unusual length of the cord itself, a large amount of water, deformities of the pelvis, an obliquity of the womb, and those malpositions of the child which prevent the presenting part from engaging readily in the superior strait and excavation. The attachment of the placenta near the os uteri also predisposes to a prolapsus, by keeping the cord just at the uterine orifice. With regard to the determining causes, we must place in the first rank a sudden rupture of the membranes, and the rapid escape of a large quantity of water, which generally sweeps along with it a fold of the cord. Consequently, when the neck of the womb is almost effaced, the bag of waters very prominent, and the head not engaged in the excavation, we must carefully avoid rupturing the membranes during a pain, for the gush of liquid, which then escapes with considerable force, nearly always carries along a loop of the cord, which thus precedes the presenting part. (Martin, of Lyons, *Comptes Rendus*, page 13.) To these causes, let us further add the descent of a hand or a foot, which seems to act as a guide, as it were, for the cord, and to open the way for it.

FIG. 112.



The right posterior occipito-iliac position, complicated by a falling of the cord.

B. The *signs* whereby this accident can be recognized, vary according to whether the membranes are ruptured or are still intact. In the latter case, the diagnosis is quite difficult; nevertheless, we can often detect something like a soft, small cord, through the portion of the membranes covering the os uteri, and slipping away before the least pressure, but the true nature of which can only be determined by the rapid pulsations in it. The rapidity of these, which Madame Lachapelle aptly compares to the ticking of a watch, can alone enable us to distinguish them from some other pulsations produced by certain arteries that occasionally ramify in the substance of the neck, and which are synchronous with the mother's pulse. This error would be more difficult to avoid, should the finger, when applied on the membranes, encounter one of the arterial ramifications of the cord, which, as in the cases described by Benckiser (see *Umbilical Cord*), may spread out on the membranes before entering into the proper tissue of the placenta. The size and the mobility of the prolapsed cord would also aid in making out the diagnosis. On the other hand, the thickness and the spongy condition of the membranes, the inequalities they occasionally present, and the folds of the child's scalp, might perhaps lead us to suspect a falling of the cord, if the clearly ascertained absence of pulsation did not promptly rectify the mistake. But after the rupture of the membranes all the difficulty disappears, for then the cord hangs down in the vagina, and often escapes beyond the vulva, and therefore may always be readily explored.

The two portions of the prolapsed fold are not uniform in their relations with each other; most generally, they touch, or are simply approximated together; and sometimes they are separated by the whole thickness of the presenting part. Nor is the fold more regular in its length; at times it only embraces the head, holding it like a sling; while at others it appears externally between the woman's thighs, though most usually it is lodged in the vagina, or at least only reaches the exterior in the latter stages of the labor. It has, in some very rare instances, been known to go up again, and thus become reduced spontaneously. (Guillemot.) As a general rule, it is situated just in front of one of the sacro-iliac symphyses, or behind the ilio-pectineal eminence.

A prolapsus, therefore, can always be detected; but it is much more difficult, though at the same time it is highly important to determine, after the exploration, whether the child is living or not. A momentary disappearance of the pulsations is not a sufficient sign; for it not unfrequently happens that the throbbing ceases in it during the pain, because the cord is then strongly compressed, but it reappears again as soon as the pain is over. This want of circulation in the vessels of the cord may continue for five or ten minutes, and it has even been known to last for a quarter of an hour, without necessarily terminating in death. It is therefore during the interval alone that any researches of this nature should be made, and the child's death can only be determined with certainty when this exploration, repeated several times under like conditions, shall have always furnished a negative result. A cold, soft, withered, and greenish cord doubtless belongs, in most cases, to a dead child, but this is not always true; and, on the other hand, as death may result very promptly from compression of the cord, the latter may still be warm and fresh, though the fœtus be dead.

[*Per contra*, one might fancy that he detected pulsations in the cord, even though the fœtus had been long dead. This is due to the fact that the finger in contact with the cord sometimes perceives very clearly an undulation of the blood within it which distends its vessels and raises the finger. It will, however, soon be observed that the phenomenon is coincident with the beginning of a pain, and is caused by the reflux of blood then expelled from the placenta. There is, consequently, no occasion for mistaking this undulatory motion for the true fœtal pulsation.]

c. *Prognosis.*—The falling of the cord is only serious as regards the fœtus; but to it the danger is imminent, since death itself may result in consequence in the course of a few minutes. Thus, in three hundred and fifty-five cases collected by Churchill, two hundred and twenty children, or nearly two-thirds, died; though it is worthy of remark that in many of these cases, the mothers were not transported to the hospital until some time after the descent of the cord, and when its pulsations had entirely ceased.

The compression of the cord, and the consequent interruption of the fœto-placental circulation, is the principal if not the only cause of death; though certain authors, among whom I can enumerate Velpeau and Guillemot, suppose that, when the cord protrudes beyond the vulva, the blood may lose its fluidity in consequence of being chilled by the external temperature, perhaps may even coagulate, and that the delay in the circulation thereby produced, combining its influence with that of a slight pressure, completely interrupts the current which, up to that moment, had only been retarded; Delamotte, Baudelocque, and Madame Lachapelle, do not admit this effect of the cold. "For I have seen," says this illustrious midwife, "the cord hang out of the vulva for several hours together without the fœtus suffering therefrom in any wise, because there was no compression; and this, in some of the cases, notwithstanding the patients had come a greater or less distance, either on foot or in some vehicle, from their residences to our hospital."

But whatever view may be adopted, it is still to a compression of the cord that we must attribute the greatest share in the production of the child's death; and under this aspect, its position, when prolapsed, will greatly modify the prognosis. The points where it is least exposed to compression are just in front of the sacro-iliac symphyses; and, as M. Nægèle has justly remarked, the frequency of the vertex positions in which the occipito-frontal diameter corresponds to the left oblique one of the pelvis, renders the danger in general much less if the fold of the cord happens to be placed behind and to the left.

The influence of this compression has been variously interpreted. According to some, the child will die from apoplexy in consequence of an excess of blood, which continues to arrive by the vein, but can no longer return to the placenta through the umbilical arteries; agreeably to others, the circulation will be free in the arteries, the vein alone being obliterated, and then the fœtus will die from anæmia or syncope. But it is only necessary to examine the intertwining exhibited by the vessels of the cord, to become convinced that this partial compression cannot exist except as an accidental circumstance, and that, as a general rule, the current must be interrupted in all three vessels at the same time. The most plausible opinion, and we believe the only one admissible, is that asphyxia is the sole cause of death;

for, as we have elsewhere stated, the placenta is the only organ of hematosis for the child up to the moment when the pulmonary respiration is established; and, therefore, if the circulation in the cord is interrupted by any compression before birth, the blood of the fœtus can no longer derive the elements necessary for its renovation by its mediate contact with that of the mother in the placenta; and from that moment the child finds itself placed in the same conditions as an adult deprived of respirable air, and, like him, dies asphyxiated.

In most cases, it is not until after the membranes are ruptured that the descent of the cord exposes it to a sufficient degree of compression to compromise the infant's life. Indeed, if we might judge from some observations of Madame Lachapelle, the pressure which it undergoes is never great enough to obliterate the umbilical vessels, so long as the head is not engaged in the superior strait. For our own part, we are inclined to believe that the simple pressure of the head on the cord may be so considerable as to interrupt the fœto-placental circulation, even before the discharge of the amniotic waters. D'Outrepont relates two cases which confirm this view; and the numerous instances in which we find the meconium mixed in large quantities with the liquor amnii at the time of the rupture of the membranes, can only be explained, in our estimation, by a momentary compression of the umbilical cord.

D. *Treatment.*—As regards the treatment, the delivery might be left to the powers of nature: 1, whenever there is a certainty that the child is dead; 2, when, though the infant be living, the membranes are only ruptured as the head becomes firmly engaged in the excavation, and when, from the fact of the contractions being energetic, there is every reason to hope that they alone will be sufficient to terminate the labor promptly; which, in fact, usually occurs in women who have a non-resistant perineum, from having previously borne children; and, 3, where the head is small, the pelvis large, and the cord situated in front of one of the sacro-iliac symphyses; for then it is only necessary to return the cord into the vagina to protect it from contact with the air. But, notwithstanding these favorable conditions, it will still be necessary to watch the state of the cord attentively, and to apply the forceps as soon as the pulsations are found to grow weaker or to become intermittent.

Under all other circumstances, the intervention of art will be indispensable. Thus, where the presentation is such as to render a natural delivery impossible, or, even if possible, where the expulsion of the fœtus would require a long and painful labor, the forceps should be applied or the pelvic version be resorted to without delay. The former operation will be the only one practicable in a vertex or face presentation, supposing both to be firmly engaged in the excavation, and that the previous attempts at reduction had proved ineffectual. It is generally thought that turning by the feet should be preferred whenever the part is not too strongly engaged.

In a presentation of the breech, the operator ought to search for the feet, if the presenting part be still above the superior strait, or bring down the groins with the blunt hook, if it has descended into the excavation.

In a presentation of the vertex or face, where these parts have not as yet engaged in the excavation, we should first endeavor to reduce the cord. Several plans have been recommended for this reduction; but the manual method, the oldest of all, is still entitled to the preference, notwithstanding the great number of instruments that have been proposed for the purpose. The operator can always proceed with greater facility behind, and on the sides of the pelvis, close to the sacro-iliac symphysis; the right hand will be used when the cord is to the left, and the left one if it is at the mother's right. Where the loop is small, it will only be necessary to push it up by the middle; but in the contrary case, it is to be gathered up and pressed back little by little, just as the taxis is usually performed in the reduction of hernia. But merely pushing the cord back into the uterus will not be sufficient to protect it, and it must be carried up above the superior strait, and the hand retained in the vagina during several contractions to prevent it from falling down. Some accoucheurs, fearing that it could not be kept in position, notwithstanding this plan, have directed the introduction of the whole hand into the womb, with a view of placing the cord on one of the child's limbs; though this precaution is useless in most cases, it would certainly be preferable to the pelvic version, says M. Guillemot, where there is a slight contraction of the pelvis.

[It is very certain that the cord has a great tendency to fall back again, unless it be passed in very deeply; so that we should not hesitate to carry the hand up to the fundus of the womb for the purpose of leaving the prolapsed portion in that part of the organ. At any rate, this practice has proved very successful at the hospital of the Clinique. It would, however, be useless to endeavor to pass the cord around one of the limbs of the child; all that is necessary being to keep it in position for a short time, until the hand is expelled, so to speak, by a contraction which compresses the parts and retains the cord in its new situation.]

But the instrumental method must be attempted, where the smallness of the external parts, or an undilated os uteri, &c., render the introduction of the hand very difficult or impracticable. Some of the various instruments proposed for this purpose might then be used; perhaps M. Dudan's, recommended by M. Guillemot, is one of the simplest and best: He takes a gum-elastic (male) catheter, of the size No. 9, armed with its stylet, and having a piece of narrow ribbon introduced into the last eye of the catheter, which is retained there by the extremity of the stylet; the ribbon is next attached to the umbilical cord, without drawing it too tight. If the loop of the latter is short, it is applied near the middle, but if long, the cord is to be first doubled up; being thus secured, the extremity of the instrument carrying the cord is then directed along the hand that had previously been introduced into the vagina, and placed within the uterine cavity. The hand in the vagina assists the return of the cord by preventing it from slipping from the noose of the ribbon.

When the reduction is completed, we must wait until the head becomes engaged, before withdrawing the instrument; then the stylet is first removed and afterwards the catheter.

[In a case of this kind I used another manœuvre, which proved very successful. The patient was a young woman in her first labor, which had made little progress, dilatation being incomplete, when the waters were discharged, carrying with them a fold of the cord. The head presented, and the dilatation was too imperfect to think of carrying the cord with the hand to the fundus of the uterus. I made several attempts to return the prolapsed loop in the same way that one tries to reduce a hernia, and to get it above the head; but it always slipped down again. To prevent it from being compressed, I passed my entire hand into the vagina, slipped two fingers into the orifice between the head and the margin of the superior strait, and thus kept them alongside of the cord which they protected, and of whose pulsations they were cognizant. My fingers, therefore, had to bear the pressure at each pain; fortunately, the labor progressed rapidly, and dilatation was completed in about an hour. I then withdrew the hand, applied the forceps quickly, and delivered a living child.]

Where the reduction proves to be impossible, the pelvic version, if the head is high up, and the forceps, if it is already engaged, are the only resources left us. But whenever version is resorted to, it is necessary to carry up the cord into the uterus, whilst searching after the feet (Boër), lest it be compressed either by the arm of the accoucheur, or somewhat later by the hips and the trunk of the child.

ARTICLE II.

OF SHORTNESS OF THE CORD.

The cord may be very short naturally; and, as elsewhere stated, it has been known not to exceed four or five inches in length; but such cases are very rare; most generally its brevity is accidental, that is, results from the numerous turns made around the body, limbs, or neck of the child. The formation of these circular loops is favored by an unusual length of the cord.

The latter, in a case reported by Baudelocque, measured fifty-nine inches, and made seven folds around the infant's neck; and Schneider saw a cord that measured three and a quarter yards (three metres), and made six turns on the neck. Nothing is more common than to find children whose bodies and necks are encircled by two or three of these folds.

An accidental shortening of the cord may render the labor difficult, either by retarding its progress, or by making it absolutely impossible, or by causing the death of the fœtus. This latter circumstance may result from the constriction undergone by the vessels of the neck, when the cord is tightly wound around this part; or it may be owing to an interruption of the circulation in the umbilical vessels, produced solely from the stricture of the cord itself, where it closely encircles a limb;[1] again, these two causes may act simultaneously, and determine the child's death much more speedily.

[1] This constriction is sometimes exceedingly great, and authors have certainly erred in denying that it could ever be such as to strangle the fætus. Besides, it is not only at the time of labor, and as a consequence of the tractions produced by the expulsory efforts of the womb, that an effect of this kind is observed, but these turns may also form during the pregnancy, and their constriction may then be extensive enough to occasion death. Thus, M. Monod met with a fœtus upon whose limbs they had left very deep marks, not merely in the soft parts, but even on the bones themselves. The infant's neck often exhibits undoubted traces of them, and in one case examined by M. Taxil, there were three circular folds around the neck, which was so diminished in size that its diameter did not exceed two or three lines (four millimetres). It is to such circular turns that M. Montgomery refers those spontaneous amputations, which M. Richer and some others have supposed were dependent on a gangrene of the part.

These turns of the cord around some part of the body are of quite common occurrence. Mayer states, in his inaugural thesis, that out of 3,587 deliveries which took place between 1828 and 1841, they were present in 685 cases. Five hundred and sixty-four of the children were born alive, seventy-two were in a state of asphyxia, but recovered under proper treatment, and forty-nine were dead. In 18 of the latter cases, however, the death could not be regarded as due to the wrapping of the cord.

[Mr. C. Devilliers, who wrote a very complete paper upon shortness of the umbilical cord, thinks that a short cord may be known to exist at the commencement of labor by the following signs: "Continuance of the fundus of the womb high up in the epigastric region until the orifice is widely dilated, even though the pelvis be well formed, the child normal as regards position and size, the waters in medium quantity, and the lower segment of the uterus altered as is usual during gestation.

"Agitation of the fœtus followed almost immediately by permanent diminution of its motions at a period not very remote from the term of gestation, when the shortening is accidental; slight motion during a part of gestation, especially near its close, when the shortness is natural and simple; a diminution and difficulty in the movements which coincides with the preceding symptoms." (*Devilliers*, Paris, 1862.)]

Generally, the delay in the labor, caused by the shortness of the cord, is not usually manifested until the stage of expulsion, properly so called, begins; and then, as M. Guillemot justly remarks, the attendant phenomena will vary according to the point of attachment of the placenta. When inserted at the fundus, it, like the wall to which it is attached, seems to descend at each contraction, and approach the os uteri, but after the pain it retreats with the fundus to its original elevation. In ordinary cases, the hand can detect this fact by being merely placed over the uterine tumor; but when a very short cord is forcibly stretched between the placenta and some part of the child's body, a particular phenomenon can be recognized by the touch; that is, the finger, when applied on the head, finds it advancing during the pain, and retreating as soon as it is over, because at this moment the fundus of the womb, which had been depressed by the contraction, regains its primitive position, and draws after it the placenta, cord, and fœtus. But this sign will evidently be wanting where the after-birth is attached to the lateral parts of the uterus.

We have met with a case in which the unusual shortness of the cord, which was only nine inches in length, certainly detained the head above the superior strait for fifteen hours after the rupture of the ovum and the entire dilatation of the os uteri; and we can affirm that, notwithstanding the closest attention, we were unable to discover any of the signs given by former authors; though it is true that the rapidity in the delivery of the after-birth, after the child's expulsion, did not permit us to ascertain at what point the placenta was inserted.

Before the membranes are ruptured, this phenomenon might be confounded with the successive elevation and descent of the head that takes place in nearly every case of labor. But to avoid such an error, it will suffice to remark, that the ascent of the head then takes place during the contraction, and it only falls back after the pain is over; being just the contrary of what occurs when the cord is dragged upon. Finally, in ordinary cases, when the head engages at the perineal strait, it is found to project during the contraction, and to retreat immediately after it from the reaction of the perineum, which, after having been forcibly distended during the pain, retracts strongly, and thereby presses it back into the vagina. But, as Delamotte and Guillemot have remarked, whenever these movements of progression and repulsion merely depend on the elasticity of the perineum, "they are only present: 1. When the head engages at the inferior strait, and then they are the less evident as the pains are more rapid and more energetic; while, on the contrary, they commence much sooner when dependent on a short cord, and become more sensible as the head approaches the vulva, because the tension on the cord is then increased; besides which, they are persistent, whatever may be the strength of the contractions, and are the more marked as the latter become stronger.

"2. On the other hand, when the placenta is attached to the lateral walls of the womb, these movements are very obscure, and the diagnosis is quite difficult. In both cases, the shortness of the cord is accompanied by pain, which is felt at the point of attachment of the placenta, particularly in the latter moments of the parturition; this pain is a sensation of dragging, or tearing, which commonly coincides with the movements of progression and repulsion; and which might be compared to those felt by the patient when an attempt is made to remove the after-birth, before its complete separation." (Guillemot.) Sometimes, says M. Devilliers, there is a sudden repression or suspension of the contraction of the womb just when it ought to be strongest.

According to M. Nægèle, Sen., these circular turns may be discovered by auscultation during pregnancy or labor, by the existence of a bellows murmur accompanying the fœtal pulsations. I agree with M. Danyau in the opinion, that further research is required to establish the absolute value of this new means of diagnosis. (See *Bellows Murmur.*)

The reader will now understand that a shortening of the cord may retard the progress of the head, whether it be still at the superior strait, or whether it has cleared the excavation and is on the point of engaging at the inferior strait. We ought to add that even the shoulders may be arrested, and the delivery of the trunk be prevented after the complete disengagement of the head, by the circular turns which are occasionally made around the child's neck by too short a cord. We were witnesses to a case of this kind, that occurred at the Clinique, in 1838, where a division of the cord, which was not made until two hours after the escape of the head, could alone effect a termination of the labor: the fœtus was born dead. Delamotte (page 305) furnishes an instance precisely similar to this.

The intervention of art is therefore sometimes necessary, although it often happens that the trunk is delivered spontaneously. However, the mechanism is not the same in cases of natural and of accidental shortening; for, in those of normal brevity, the head may remain applied against the vulva after its disengagement, without much inconvenience, and the extra-uterine respiration may be established and kept up. In a short time, the womb gradually contracts on the parts of the child that it still contains, and, being itself forced along by the bearing-down efforts of the patient, it sinks into the vagina, and, by thus approaching the vulvar orifice, may easily force the trunk to the exterior. Occasionally, this descent of the womb does not occur at all, or else is not sufficient to permit the escape of the child; and then a rupture of the cord, or a detachment of the placenta, can alone enable the uterine efforts to complete the delivery. Thus, in a case of the kind reported by Malgouyré, the discharge of the waters, the delivery of the child, and the expulsion of the after-birth, all occurred simultaneously: and the following instance is related by Dr. Rigby. After two or three hours of severe pains, the fœtus was suddenly expelled, and the cord was broken at about two inches from the umbilicus, so that, when the midwife attempted to deliver the after-birth, she could not find the other end of the cord; but, having introduced her hand into the womb, she felt and extracted the placenta; and it was then discovered that the cord had been lacerated at its point of insertion.

In labors complicated by an accidental shortening of the cord, the child's head passes beyond the vagina, and retains its position there until a renewal of the pain; and when the latter comes on, the head is observed to pass to the sides of the vulva, whilst the shoulders, back, and breech successively disengage. This expulsion is sometimes effected so rapidly that it is difficult to follow it; but, if it be delayed in the least, a prompt intervention is requisite, for, as elsewhere stated, the compression made by the folds around the neck may speedily prove fatal to the child.

In breech presentations, the labor usually terminates in the following manner, when abandoned to itself; the nates, after having been forced down to the vulva by the uterine contractions, turn up toward the side where the cord is situated, and then the trunk descends, becoming flexed on itself in the passage; so that, by the time the head reaches the excavation, the body of the child forms a curve, whose concavity corresponds very nearly to the symphysis pubis.

Independently of the delay that it may cause in the progress of parturition, and the consequent danger to the fœtus, a shortening of the cord may produce other and serious accidents to the mother. It is to this circumstance particularly, that we must in most cases attribute the rupture of the cord, and the premature separation of the placenta, points to which we shall return when treating of uterine hemorrhage. The danger of these accidents will vary greatly with the period of their occurrence; thus, at the commencement of labor, the bleeding thereby occasioned might seriously compromise the lives of both mother and child, if the resources of our art were not promptly interposed. But if they do not occur until the moment when the head is ready to clear the vulvar orifice, they may rather be considered in a favorable light, for, as we have just seen, this is one of the means that nature employs for terminating the delivery.

Again, if the cord and the adhesions of the placenta should obstinately resist, it is possible that an inversion, or at least a depression of the uterus, might be the immediate consequence of the child's expulsion. The inversion occurs towards the end of the labor, when the distention of the parts obliges the woman to bear down; and as she still continues to strain, after the cessation of all uterine contractions, the relaxed womb yields the more readily to the action of the abdominal muscles, which tend to depress its fundus, because the short umbilical cord drags the uterine wall, where the placenta is attached, in the same direction.

Treatment.—The disastrous consequences that may result from a shortening of the cord present different indications for treatment, according to the stage of the labor at which its existence is detected. When the membranes are still unbroken, if the os uteri be freely dilated, the contractions energetic, and there is every reason to suppose, from the signs before given, that a dragging on the cord is the cause of the delay, they should be ruptured at once; for, after the waters have escaped, the uterus will contract, its fundus will approach the cervix, and the cord, being no longer dragged upon, will permit the head to descend into the excavation. If the head be at the inferior strait, at the time when the alternate movements of elevation and descent begin to manifest themselves during and after the contraction, the forceps should be applied. But where the head has only the resistance of the soft parts to overcome, we must be content with preventing it from remounting in the excavation after each pain, as much as possible; for that purpose we must apply the hand strongly on the perineum, and while supporting it, favor the escape of the head by pressing it up in such a way as to aid its process of extension or disengagement. It would also be advisable to have the hypogastrium compressed at the same time by an assistant, in order to prevent the uterus from ascending during the interval between the pains. Lastly, after the head is delivered, the accoucheur should immediately loosen the turns of the cord around the neck, and slip them over it; and where these folds are so tight as to resist the tractions made with that object, they should be divided, but it is not requisite to apply the ligature to the umbilical extremity of the cord at once. In most cases, indeed, it is necessary to allow this to bleed a little after the birth, in order to relieve the apoplectic state of the fœtus; for, by applying the ligature too soon, we would be deprived of this resource. Nevertheless, where the expulsion is unusually delayed, the fœtal end of the cord, known by the jets of blood which issue from it, will have to be slightly pinched between the two fingers to prevent hemorrhage.

Dragging of the cord entwined around the trunk or limbs is not at all unfrequent in natural labors by the breech, and when pelvic version has been effected. It is to be remedied by making moderate tractions on its placental extremity, and if these are not sufficient, it should be divided, and the labor terminated as speedily as possible. The same precepts are applicable in all cases where the brevity of the cord is natural; and if the accoucheur is obliged to carry his hand up into the womb to ascertain the nature of the obstacle, he should take advantage of the occasion to effect pelvic version, and to draw down the child until the base of its chest appears at the vulva; then the cord is to be cut and tied, or else compressed with the fingers, and the extraction of the fœtus completed at once.

It is advisable to introduce the hand again into the uterus, after the placenta is delivered, to ascertain that the fundus of the organ is neither depressed nor inverted.

[CHAPTER XV.

OF DYSTOCIA DUE TO THE FŒTUS.

In order that delivery should be effected spontaneously and without danger, it is not only necessary that the mother should be well formed and the labor uncomplicated by any of the accidents which have been already studied, but the size of the fœtus and the conformation of the different parts should have a proper relation with the canal to be traversed. It ought also to present by one of the extremities of its long axis, which should be properly situated in regard to the pelvis. The fœtus at full term may also be diseased, or so deformed as to have its size sensibly increased.

In the present chapter, therefore, we have to consider the indications arising from unusual size, wrong presentations and positions, diseases and monstrosities of the fœtus.

ARTICLE I.

UNUSUAL SIZE OF THE FŒTUS.

Whether the pelvis be contracted or the size of the fœtus greater than usual, the relative proportions required for an easy delivery no longer exist, and the labor is difficult.

Very rarely does the size of the fœtus exceed a certain limit and render delivery impossible.

The first chapter, however, of Dugès' paper is devoted to cases of this kind, though he has met with very few in his own practice. One instance of the kind has been already mentioned in the present work. (See p. 216.)

There can be no doubt that labor may be rendered longer and more painful by unusual size of the child; still, if all the other conditions are favorable, delivery will most probably be effected by the unaided efforts of nature. "It is more particularly when it becomes necessary to turn a very large child that the greatest difficulties are liable to be encountered, and that especial care should be taken to avoid the crossing of the arms back of the neck, to turn the face first toward one of the sides of the pelvis and then toward the sacrum, and also to depress the chin so as to bring the sub-occipito-bregmatic and bi-parietal diameters parallel to those of the pelvic canal and of the external genital organs." (Dugès.)

The unusual size may not be general, but confined to some one part of the fœtus; therefore, to complete what has been already said, we shall treat briefly of unusual size of the head and shoulders.

Unusual Size of the Head.—To this cause of dystocia, our colleague and friend, Dr. Joulin, Adjunct Professor of the Faculty of Medicine, at Paris, devoted a long chapter of his thesis for the *Concours*. According to him, the Germans admit that trouble may be due to the size of the head alone, besides which they also call attention to a peculiarity of the ossification, little known in France, which adds to the difficulty of the situation; viz., the development of ossa wormiana in the fontanelles, causing their solidification.

It is very hard to determine what ought to be done in cases of this kind; it is almost impossible to become aware of the size of the child whilst it is still within the womb, so that the practitioner who finds the progress of the case arrested in an apparently well-formed pelvis, will very probably decide upon active interference before the true cause of the delay is detected, and apply the forceps or cephalotribe, according to the amount of difficulty which the size of the head shall present to its extraction. (Joulin.)

Unusual Size of the Shoulders.—Labor may also be rendered difficult by too great length of the bi-acromial diameter. This cause of dystocia, which had been suspected for a long time, was made by Levret, under the title of impaction of the shoulders, the subject of very remarkable researches which, of themselves, ought to have prevented its falling into oblivion. In our own time it has been again asserted and placed beyond doubt by M. Jacquemier, who wrote an excellent paper upon it. It were hardly necessary to say that we have to do less with the size of the shoulders proper than with that of the chest; still, on account of their situation and projection, the shoulders are included in the impeding part. The shoulders and upper part of the chest, says M. Jacquemier, being retained at the entrance of the pelvis after having obstructed the passage of the head through the external genital parts, again hinder the passage of the trunk after they have got to the bottom of the pelvic cavity. But it may also happen that when the hindrance to the exit of the head occasioned by the presence of the shoulders at the entrance of the pelvis has been at last overcome, the remainder of the body shall pass without trouble. Still, the opposite may occur, and the difficulty occasioned by the shoulders only declare itself after the head has been born.

I might add three cases of my own to those mentioned by M. Jacquemier, having been called upon to terminate the delivery under the following circumstances: in all the head had been born, but although traction was used, it was found impossible to extract the trunk. My own efforts were more successful, though I must acknowledge that I had to employ considerable force.

It is important to recognize this cause of dystocia and overcome it quickly, inasmuch as it leads rapidly to the death of the child. When the shoulders, continues M. Jacquemier, are arrested at the superior strait and thus keep the head at the bottom of the cavity of the pelvis, or when they are more or less engaged in the inferior strait, as the difficulty is due to the size of the chest rather than to the position of the shoulders, there is no indication for endeavoring to alter the position of the latter, but the forceps should be applied. If this instrument prove ineffectual, what is next to be done? As soon as the fœtus has ceased to live, or its chances of life are rendered highly improbable, the mother's life ought not to be endangered by too long expectation. Craniotomy should be performed, followed by cephalotripsy; in short, the size of the head ought to be so lessened as to enable the accoucheur to pass his hand deeply, seize the arms of the child and bring them down, after which, by drawing upon them, the trunk can be delivered.

When the great size of the shoulders arrests delivery only after the head has been born, what ought to be done? At first it would seem reasonable to draw somewhat upon the head, and although it might answer in simple cases, it would be useless provided the difficulty were considerable. Indeed, there is risk of tearing off the head, for it has often been done. Therefore it were much better to work two fingers into one of the axillæ and draw the shoulders down; but if necessary, there should be no hesitation in seizing the root of the arm with the entire hand, for thus only can it exert its full power.

Tractions upon the axillæ are a step in the process which consists in the successive disengagement of the arms, followed by tractions upon them in order to deliver the trunk. This latter method is preferred by M. Jacquemier as being the most efficacious, because it has the advantage not only of affording a solid bearing, but of removing from the chest the thickness of the arms and the abrupt projections formed by the stumps of the shoulders. (Jacquemier.)]

This book is the property of
COOPER MEDICAL COLLEGE,
SAN FRANCISCO, CAL.
and is not to be removed from the
Library Room by any person or
under any pretext whatever.

ARTICLE II.

IRREGULAR OR COMPLICATED PRESENTATIONS AND POSITIONS: ANOMALIES IN THE MECHANISM OF LABOR.

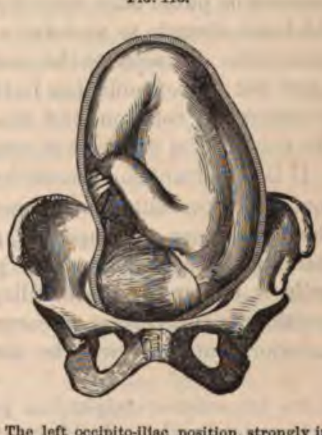
The ancients applied the term malposition to all those cases in which the top of the head did not correspond to the os uteri. But, as we have already demonstrated, the labor nearly always terminates favorably, both for the mother and child, in the presentations of the face and breech, though it is a little more difficult than usual; and experience has even proved that it is barely possible in those of the trunk. Nevertheless the first three presentations offer certain anomalies and irregularities, that may at times render the labor difficult, and require the intervention of art; for, although the presentations of the vertex, face, and breech are usually free and regular, yet they may be irregular or inclined. But these last so rarely constitute an obstacle to the spontaneous termination of the labor, that we have not hesitated to include them in the description, heretofore given, of the mechanism of natural labor. In fact, the only modification they determine in this mechanism is that the head, in clearing the superior strait or traversing the excavation, undergoes a movement of correction, whereby the occipito-frontal or the sub-occipito-bregmatic circumference becomes parallel to the plane of the strait. But this movement is necessary; for, if the head exhibits its normal size, the delivery is only possible under that condition,[1] and, when it does not take place, the resources of art are indispensable. Certain anomalies, capable of interfering with the expulsion, may also take place in the movements of the head. We must now ascertain what are the indications for treatment presented in these particular cases.

§ 1. Inclined Positions of the Vertex: Anomalies in the Mechanism of Labor.

Under this title we include all those positions that have been described by Baudelocque as the positions of the sides of the head, of the ears, the temples, and the occiput; the former of which is recognized by the presence of an ear, the angle of the jaw, or by the parietal protuberance; while a presentation of the occiput is detected by the triangular form of the posterior fontanelle, by the lambdoid sutures, and the vicinity of the neck.

In general, when an inclination of this kind is detected at the onset of labor, or shortly after the membranes are ruptured, there is nothing to be done; for it is well known that, in far the greater number of cases, the conversion is effected sponta-

Fig. 113.



The left occipito-iliac position, strongly inclined on its posterior parietal region.

---

[1] However, we have known this conversion of an inclined vertex position into a free one to occur at the inferior strait in a woman with her first child; the head was

neously; but, if the head still retains its primitive position for five, six, seven, or eight hours after the discharge of the waters, and its descent is thereby impeded, we must attempt an artificial correction. It is possible to accomplish this with the hand alone, which is always to be tried before resorting to an introduction of the lever or forceps; and it is unnecessary to add that any obliquity of the uterus, should it exist, must first be remedied. As a general rule, that hand should be used whose palmar face would grasp the vertex the most readily; and, when introduced into the womb (see *Version*), it grasps the occiput so as to draw upon it, after having first removed it from the iliac fossa; whilst considerable pressure is made with the other hand over the hypogastric region, in order to force the head to descend. When the correction cannot be effected by the hand alone, most accoucheurs recommend the employment of the lever; but we should decidedly prefer having recourse to the forceps, the blades of which would act at first as a lever in rectifying the head, and then, by their traction, the labor could be terminated almost immediately. Because, where seven or eight hours have been spent (according to our precept) in the vain hope that the powers of nature would be adequate to rectify the inclination; and where the operator has unsuccessfully attempted to produce the correction by his hand alone, it must be evident that an early termination of the labor is indicated in the double interest of the mother and child; and that, consequently, the forceps should be preferred in such cases to the lever.

The attempt to seize the head properly with the forceps and bring it down into the excavation, does not always succeed, in which case the difficulty may be overcome by turning; at least, I found it to answer in two cases of failure by the forceps. I think, also, that I should be disposed to have recourse to it immediately, when the uterus was but slightly contracted, and still contained a considerable amount of water.

The occipito-posterior positions which are not converted naturally into anterior or pubic ones, may also allow of the spontaneous disengagement of the head, though, as we have already stated, they sometimes present insurmountable obstacles to the termination of the labor. We repeat that we have but little confidence in efforts made with the fingers to produce this movement of rotation, and that the application of the forceps seems to us the most useful means that can be employed. (See *Forceps.*)

It is important to observe that the continuance of the occiput posteriorly sometimes prevents the engagement of the head, which remains, long after the membranes are ruptured, above the superior strait, and that, notwithstanding the contractions are powerful. In such cases, the posterior fontanelle is hidden by the swelling of the scalp, and in order to diagnose the position, it is necessary to carry the finger upward and in front, when the anterior fontanelle will be discovered. At each contraction, the vertex

---

in the left anterior occipito-iliac position, and was at the same time inclined on the right parietal region. In descending into the pelvis, it retained this position, so that, when it had reached the floor of the excavation, we detected the ear; but it became rectified, after several strong pains, and cleared the inferior strait immediately after having undergone the movement of correction. The head was small, although the fœtus was at full term.

strikes the horizontal branch of the pubis, and the presentation then tends to become converted into one of the *nucha*, so called by the old accoucheurs. I have noticed this anomaly more especially in the left occipito-posterior positions, and have always been obliged to use the forceps; quite powerful efforts are usually required to extract the head.

The vertex positions, even when not inclined, sometimes present anomalies in their mechanism. Thus the movement of rotation, which in the transverse positions is calculated to bring the occiput under the pubic arch, is occasionally delayed for a long time, and thereby greatly retards the labor. When this delay is dependent on the feebleness of the uterine contractions, an application of the forceps is the best remedy. But, according to many authors, it may also be owing to what Levret called the wedging-in of the shoulders; that is, the latter then present their long bis-acromial diameter to the smallest one of the superior strait, and thus become firmly engaged or wedged there, in such a way that they cannot descend any further, and therefore arrest the progress of the head. This wedging of the shoulders, which can scarcely occur without a slight contraction of the abdominal strait, has been detected by Levret, by Delamotte, by Ruysch, *et als.*, and its occasional occurrence is admitted by Desormeaux and Dugès; consequently it should be regarded as being possible. (See p. 840.) This cause of dystocia would scarcely ever be suspected during the labor, unless attention were drawn to it by the mobility of the head in the excavation (Fried); this is the only sign that would be likely to arouse attention, where a normal conformation of the inferior strait has been ascertained, and where the contractions are strong and sustained. Under such circumstances, Levret advises (and Desormeaux seems to approve the counsel) the patient to be placed on her elbows and knees, with her head declining, with a view of removing the weight of the child's shoulders from the mother's parts; and then the accoucheur should slip his hand along between the head and the pelvic walls, seize the shoulder that is locked at the sacro-vertebral angle, draw it to one side and change its position. Although the performance of this manœuvre is attended with difficulty, yet it is the only one practicable if the fœtus be living; but where it is dead, he ought to diminish the head by craniotomy, so as to open a more ready passage up to the shoulders.

Supposing this diagnosis to be well made out, it would seem proper to follow the recommendation of Desormeaux; but the fact is, it is so very difficult that, as M. Jacquemier judiciously remarks, the use of the forceps, though in reality irrational, is perhaps the only remaining resource.

The rotation of the head, in virtue of which the occiput gets under the symphysis pubis, may likewise be rendered difficult, or even wholly impossible, by the size of the sero-sanguinolent tumor of the scalp, that is always formed when the head remains in the excavation for some time; for, by engaging itself in the void of the pubic arch, this tumor may render the movement of rotation absolutely impossible. (Tarnier.) Of course, the forceps must then be applied.

Direct occipito-pubic or occipito-sacral positions are very rare, though certainly it is a mistake to deny their existence. We have already stated that the occiput may be in relation with any point of the superior strait.

In the immense majority of cases these direct positions are converted, after the labor begins, into the diagonal ones; for the convexity of the forehead in the occipito-pubic positions, and that of the occiput in the occipito-sacral ones, having to glide over the sacro-vertebral angle, are almost always turned either to the left or to the right.

In some cases, however, the primitive positions continue, and the labor terminates in nearly the usual manner. It occasionally happens that if the head is large, and the pelvis but moderately developed, though well formed, the former is arrested at the superior strait, and impacted, as it were, by the two extremities of its occipito-frontal diameter. In such cases, the application of the forceps is the only resource.

§ 2. INCLINED POSITIONS OF THE PELVIS: ANOMALIES IN THE MECHANISM OF LABOR.

Sometimes one hip, at others the lumbar region, or the lower part of the abdomen, according to the direction of the inclination, may engage first at the upper strait; particularly where the uterine obliquity is well marked. We must, therefore, correct this obliquity, which is the original cause of the anomaly; then, if that is not sufficient to replace the breech in a horizontal position, the feet are to be sought after and brought down, or else one of the groins be acted on by hooking a forefinger into it. (See *Mechanism of Labor in Breech Presentations.*)

§ 3. INCLINED POSITIONS OF THE FACE: ANOMALIES IN THE MECHANISM OF LABOR.

The face positions may likewise be irregular; that is, it may happen either that only one cheek engages, in consequence of a lateral inclination, or else that the head, being but little extended, the forehead is found at the centre of the superior strait; or, on the other hand, this extension being carried to an extreme, that the chin and the front of the neck are alone accessible to the finger; but in all these, as in the preceding cases, nature herself is generally able to accomplish the delivery. The instances in which the forehead is first placed at the centre of the upper strait are quite frequent; but the extension being completed at the moment when it engages the excavation, the face then becomes completely horizontal. (See *Mechanism of Labor by the Face.*) The same is true of the *malar* positions, the correction of which, like that of the *parietal* positions of the vertex, is effected during the period of descent. In those rare cases where the inclination resists the power of the uterine contractions, the correction with the hand at first, then, in case of failure, the application of the forceps, if the head is engaged and immovable, or the pelvic version, if it be high up and can easily be displaced, appear to us the proper measures.

The spontaneous reduction, just alluded to, as the most ordinary termination of the frontal or malar positions, is much more difficult in the cases where the chin, in consequence of the excessive extension of the head, has a tendency to engage first, and approach the centre of the excavation. For then, according to the observation of Madame Lachapelle, the head not only presents unfavorable diameters, but the body likewise shows a disposition to descend along with the face; though at the same time it presses the latter back from the passage, and thus creates an obstacle to its escape, while the contraction transmitted by the spine rather tends to augment than to correct the inclination. Under such circumstances, we can trust less to the powers of nature, and therefore must endeavor to change the position by a resort to pelvic version.

These lateral inclinations are usually primitive, and, as we have already stated, are reduced spontaneously into correct positions. But it may also happen that a position which is entirely regular at the beginning of labor, may become converted into an inclined one, which nothing can restore. Thus, Dr. Birnbaum, of Bonn, mentions a case of right tranverse mento-iliac position, of the most regular kind, which became converted into a left anterior occipito-iliac one, strongly inclined upon the right parietal bone. The labor had to be terminated by the forceps.

It is well known that a spontaneous delivery in face positions requires that they should be converted into mento-pubic ones; but this process of rotation, which is easily effected in the mento-anterior varieties, that is to say, in the cases where the chin was primitively in relation with some part of the anterior half of the pelvis, is much more difficult in the mento-posterior positions, and sometimes even it does not take place at all. And it must be acknowledged that an unreduced engagement of the face, and its want of tendency to reduction, constitute one of the most serious difficulties met with in the obstetrical art.

Now, with a view of more clearly specifying the various indications for treatment that may present under such circumstances, we will suppose four different cases of face positions, namely:

1st. A woman has been in labor for a considerable time, the membranes are ruptured, and five or six hours, or even more, have elapsed since the waters escaped, during all which period the uterine contractions have been very strong; a good conformation of the pelvis, and a complete dilatation of, and no resistance from, the os uteri are recognized by the touch, and yet the presenting part still remains high up and does not engage in the excavation; but, in searching for the causes that retain this part at the superior strait, under so many favorable circumstances, it is found that the face presents in a mento-posterior position. Here there would be reason to conclude, in my estimation, that the delay in the labor is dependent on the non-reduction of the mento-posterior position into an anterior one; and, therefore, I think that an attempt should be made to convert the face position into one of the vertex. This could be done by introducing that hand whose palmar face embraces the vertex most readily; which would be the right one when the chin is directed backwards and to the right side, and the left in the opposite case; then, after having grasped the head with the whole hand, endeavor to push it up above the superior strait, and, if successful, surround the vertex with the palmar face of the four fingers, and flex the head on the chest, when, the position of the face being converted into one of the vertex, the uterine contractions will accomplish the rest.

I am now convinced that this manœuvre will rarely prove successful, therefore it should be attempted very carefully, and pelvic version substituted for it without much delay.

2d. If, to the mento-posterior position just described, whether the face be engaged or be still above the abdominal strait, any *accident whatever* be joined *that demands a prompt termination of the labor*, it is evident that the pelvic version is the only operation that could be resorted to with a prospect of advantage.

3d. If the mento-posterior position is coincident with a moderate contraction of the pelvis, most authors advise the conversion of the facial position into one of the vertex, and then the application of the forceps upon the flexed cephalic extremity. It seems to us, that this previous cephalic version would prove very difficult, if attempted long after the membranes are ruptured, and we should give preference to turning by the feet. We shall have occasion hereafter to settle this question when we come to discuss the use of the forceps in cases of contracted pelvis. (See *Forceps.*)

The application of the forceps on the face in the mento-posterior positions, seems to us an extreme measure, which should only be employed when nothing else can be done, as in the next variety.

4th. Lastly, there are some unfortunate cases where it is impossible to push up the presenting part, either because the head has cleared the cervix uteri, or because the strong contraction of the womb renders every attempt abortive; and, therefore, both the pelvic and the cephalic versions are altogether out of the question. The accoucheur must then necessarily have recourse to instruments. The lever, the common forceps, the crotchet, and the embryotomy forceps have all been proposed in turn; but before resorting to the latter, the first should always be tried.

In certain cases, the lever has proved very useful, and, where applied on the vertex or occiput, has occasionally depressed this part, and thus converted a face presentation into one of the vertex. It is oftentimes more easily managed than the forceps when the head is high up, owing to the difficulty of getting the second blade of the latter to the proper height and position; and I may mention that it proved very serviceable in a case to which I was called by Dr. Fournier, where the head had engaged in the excavation, in the right mento-posterior position, and could neither be pushed up nor advantageously grasped by the forceps.

I believe that, in common with many practitioners, I have erred in proscribing this instrument almost altogether from practice; for the lever, in my opinion, may render very important aid in those posterior positions that approach a transverse character; and in which, from being still high up, an application of the forceps is exceedingly difficult. (See *Lever.*)

As to the forceps, though proscribed by Madame Lachapelle, in the cases under consideration, it may be tried as a last resource, being far better than embryotomy when the child is living; but to be successful, it is necessary that the operator should be well versed in the movements that are to be given to the head by the instrument. Thus, supposing the blades are properly applied on the sides of the head (and the difficulty of this is well known), should we attempt to bring the chin round in front (Smellie)? or would it be better, leaving the chin posteriorly, to endeavor to depress the forehead and occiput, and then to disengage these parts first under the pubis? Relying on the cases published by former authors, I do not hesitate to decide in favor of the last manœuvre; for every practitioner must acknowledge that the rotation of the chin forwards exposes the child to very great dangers from the extent of the movement in the atloido-axoid articulation, and the two favorable cases reported by M. P. Dubois, which he himself considers as exceptions, cannot make us overlook all those in which this excessive rotation has cost the child's life.[1]

I am willing now to be less exclusive, for M. Blot's facts, besides some others, have convinced me that artificial rotation of the chin in front may sometimes be accomplished without necessarily compromising the life of the child. We may be content, indeed, to bring the chin up to the ischio-pubic ramus, in which case, if it were a sacro-iliac position, the rotation would hardly exceed a quarter of a circle; and if it were at first a mento-sacral position, we might hope that the uterine contractions would cause the body to follow the rotation given to the head by the forceps, and twisting of the neck be thus avoided.

We shall see hereafter how far the modifications of the process to be employed, recommended by MM. Champion, Baumers, and Danyau, are capable of facilitating this rotary movement.

If it be found impossible to rotate the head, what should be done next? Grounding myself on the observations of Smellie (t. xi. p. 570), of Meza (*Acta Regiæ Societatis Med. Hauniensis*, t. xi. p. 379), and of Siebold (*Siebold's Journal*, ann. 1830, p. 209), I think that one might, after having applied the blades as accurately as possible on the sides of the head, draw directly downwards and backwards, with a view of depressing the vertex.

I am well aware of the objections to this mode of procedure, and that it may be said that, during the movement of flexion, which you impress on the head, the long occipito-mental diameter must necessarily pass one of the diameters of the excavation, thereby often creating an insurmountable obstacle to the delivery. I do not deny the force of this objection, and am willing to confess that in theory it is not altogether satisfactory; still, of

what consequence is the theoretical impossibility, where positive facts bearing on this point can be adduced, and some of which I have just quoted? But the somewhat material authority of facts is not the only one I might invoke; for does not our reason tell us that, when any of those cases (fortunately very rare) are presented in practice, which seem beyond the pale of all theoretical notions, and in which the practitioner is constrained to do what he can, not what he would, the wisest course is to follow as closely as possible the route traced out by nature? Now, has it not often happened that the labor terminated alone, in the mento-posterior positions of the face, and yet the chin has remained behind throughout? And what has been the mechanism under such circumstances? By consulting the published cases, we shall find that the uterine contraction was incapable of depressing the chin, and has seemed to transfer its action to the occiput; and then the forehead, the vertex, and the occipital extremity, by slipping behind the symphysis pubis, have successively appeared at the centre of the pubic arch. It is not, therefore, logical to recommend an attempt to impress the same movement of flexion on the head, in the hope that the tractions by the instrument, coming to the aid of the expulsory efforts of the womb, would succeed in accomplishing what these latter alone could never effect.

---

[1] I have had occasion to prove very evidently the danger attendant on this extreme rotary movement.

In July, 1845, I had charge of a case of right mento-sacro-iliac position in a primiparous female, and the continuance of which rendered delivery impossible, and required the intervention of art. After fruitlessly endeavoring to press up the head, we were obliged to use the forceps, the child being still alive. Having applied the blades upon the sides of the head, we endeavored to bring down the vertex, but it was impossible. Neither was one of the branches of the forceps applied as a lever upon the vertex more successful. We thought it right, before having recourse to embryotomy, to endeavor to turn the chin in front; therefore, replacing both blades of the forceps, we turned the head so as to make the chin correspond with the right extremity of the transverse diameter, and next, after a slight rearrangement of the blades, behind the right acetabulum. The face was then in the lower third of the excavation, and the vulva being partially opened by the instrument, we saw distinctly motions of the lips and tongue of the fœtus. The rotation was then completed, and when once the chin came in front, the head was disengaged by the usual flexion. Though the heart of the fœtus still beat feebly, it could not be restored to life by long-continued and well-directed efforts.

I am convinced that the death of the fœtus was in this case simply due to the extreme twisting of the neck.

What we have stated respecting the impossibility of spontaneous conversion in direct mento-sacral positions, and of its natural explanation in the diagonal mento-posterior positions, finds here its practical application. The consequence is, that if the chin were turned directly toward the anterior face of the sacrum, we should, before flexing the head with the forceps, impress upon it a slight rotary movement, which would bring the chin to one of the sacro-iliac symphyses, preferably toward the right, in order to avoid compressing the rectum, which is situated to the left.

My own experience, as well as that of others, has so much changed my view in regard to this point of practice, that I willingly admit having been hitherto too exclusive. I believe, therefore, that both methods may succeed in some cases, and it being impossible to determine *a priori* in which one or the other will be more successful, it were prudent to try them successively.

It should, therefore, be well understood that accoucheurs of the present day, drawing encouragement from the successful issue in certain cases of a recent date, are of opinion that the first effort should be to bring the chin under the symphysis pubis.

Again, there are some unfortunate cases in which, after having vainly attempted all the different manœuvres just referred to, craniotomy becomes our only resource.[1]

---

[1] I have quite recently witnessed a case of this nature with Dr. Letannelet, who requested my attendance on a young lady in her first labor. I saw her at eight o'clock in the evening, and detected, as my learned associate had previously done, a right mento-posterior position (the frontal variety): the head had been firmly engaged since three o'clock in the afternoon, and from that hour had not advanced a single line. At eleven, as no change had taken place either in its position or elevation, we attempted unsuccessfully to push it up. Both M. Letannelet and myself tried the lever and the forceps in vain; but before resorting to craniotomy, which was then deemed indispensable, we requested M. Dubois to see the patient. He arrived at one o'clock in the morning, and renewed the attempts that we had before made, without any better suc-

Do not the supposititious cases just given (which could easily be sustained from the facts reported by authors), by rendering us acquainted with the various difficulties that may be encountered in these cases, lead us to adopt, for the mento-posterior position, the rules heretofore laid down by Baudelocque, Gardien, and others, for all face positions? And though, in the present state of our science, the mento-anterior positions should be abandoned to nature, yet does the same rule hold good with regard to the mento-posterior ones? In a word, if this last position be clearly recognized before or shortly after the membranes are ruptured, should we not, prior to he engagement of the face, and while the head is still movable, endeavor o convert it into a vertex position, and thus prevent the difficulties that ight subsequently arise? If I had to decide under such circumstances, I ould certainly resolve the question in the affirmative.

§ 4. PRESENTATION OF THE TRUNK.

A natural delivery in trunk presentations is a very unusual occurrence, nd one upon which the accoucheur should never rely. It is therefore an bsolute rule in practice to attempt to bring one extremity of the fœtus to he superior strait as soon as possible, by resorting either to the pelvic or he cephalic version. (For the divisions, causes, and diagnosis of this echanism, see *Natural Labor*, page 368, *et seq.;* and for the indications, he chapter devoted to *Version.*)

§ 5. COMPLICATED PRESENTATIONS.

Under the title of "fallings" (*procidentiæ*), Madame Lachapelle has escribed the untimely descent of any part whatever of the child, which annot of itself constitute a particular position on account of its smallness or obility, but which, however, might complicate the presentation of a more xtended region. Thus, the umbilical cord, the feet, or the hands, may dividually or collectively come down at the same time as the head or reech. This complication will be very readily detected by the touch, and erefore it is unnecessary to enumerate the peculiar signs that distinguish ch of these parts.

We have already spoken of a falling of the cord, and of the means of medying it. Again, in those cases where one hand has slipped under the ad or breech, the labor may terminate alone if the pelvis is well formed d the contractions are strong and continued; and hence we should delay l operations. Even the presence of both hands on the lateral parts of the ad has not always proved an insurmountable obstacle to the spontaneous rmination of the labor, for all these parts have occasionally been expelled gether; but if the passage be somewhat contracted and the soft parts sistant, it would be advisable to terminate the delivery artificially by the application of the forceps or by version, according to whether the head has or

---

cess, and craniotomy was then decided upon; but as the woman had great need of rest, and the necessary instruments were not at hand, the operation was deferred until eight o'clock A. M., when it was accomplished with much difficulty; for, notwithstanding his dexterity, M. Dubois had the greatest trouble in extracting the head with the embryotomy forceps.

what consequence is the theoretical impossibility, where positive facts bearing on this point can be adduced, and some of which I have just quoted? But the somewhat material authority of facts is not the only one I might invoke; for does not our reason tell us that, when any of those cases (fortunately very rare) are presented in practice, which seem beyond the pale of all theoretical notions, and in which the practitioner is constrained to do what he can, not what he would, the wisest course is to follow as closely as possible the route traced out by nature? Now, has it not often happened that the labor terminated alone, in the mento-posterior positions of the face, and yet the chin has remained behind throughout? And what has been the mechanism under such circumstances? By consulting the published cases, we shall find that the uterine contraction was incapable of depressing the chin, and has seemed to transfer its action to the occiput; and then the forehead, the vertex, and the occipital extremity, by slipping behind the symphysis pubis, have successively appeared at the centre of the pubic arch. It is not, therefore, logical to recommend an attempt to impress the same movement of flexion on the head, in the hope that the tractions by the instrument, coming to the aid of the expulsory efforts of the womb, would succeed in accomplishing what these latter alone could never effect.

What we have stated respecting the impossibility of spontaneous conversion in direct mento-sacral positions, and of its natural explanation in the diagonal mento-posterior positions, finds here its practical application. The consequence is, that if the chin were turned directly toward the anterior face of the sacrum, we should, before flexing the head with the forceps, impress upon it a slight rotary movement, which would bring the chin to one of the sacro-iliac symphyses, preferably toward the right, in order to avoid compressing the rectum, which is situated to the left.

My own experience, as well as that of others, has so much changed my view in regard to this point of practice, that I willingly admit having been hitherto too exclusive. I believe, therefore, that both methods may succeed in some cases, and it being impossible to determine *a priori* in which one or the other will be more successful, it were prudent to try them successively.

It should, therefore, be well understood that accoucheurs of the present day, drawing encouragement from the successful issue in certain cases of a recent date, are of opinion that the first effort should be to bring the chin under the symphysis pubis.

Again, there are some unfortunate cases in which, after having vainly attempted all the different manœuvres just referred to, craniotomy becomes our only resource.[1]

---

[1] I have quite recently witnessed a case of this nature with Dr. Letannelet, who requested my attendance on a young lady in her first labor. I saw her at eight o'clock in the evening, and detected, as my learned associate had previously done, a right mento-posterior position (the frontal variety): the head had been firmly engaged since three o'clock in the afternoon, and from that hour had not advanced a single line. At eleven, as no change had taken place either in its position or elevation, we attempted unsuccessfully to push it up. Both M. Letannelet and myself tried the lever and the forceps in vain; but before resorting to craniotomy, which was then deemed indispensable, we requested M. Dubois to see the patient. He arrived at one o'clock in the morning, and renewed the attempts that we had before made, without any better suc-

Do not the supposititious cases just given (which could easily be sustained from the facts reported by authors), by rendering us acquainted with the various difficulties that may be encountered in these cases, lead us to adopt, for the mento-posterior position, the rules heretofore laid down by Baudelocque, Gardien, and others, for all face positions? And though, in the present state of our science, the mento-anterior positions should be abandoned to nature, yet does the same rule hold good with regard to the mento-posterior ones? In a word, if this last position be clearly recognized before or shortly after the membranes are ruptured, should we not, prior to the engagement of the face, and while the head is still movable, endeavor to convert it into a vertex position, and thus prevent the difficulties that might subsequently arise? If I had to decide under such circumstances, I would certainly resolve the question in the affirmative.

§ 4. Presentation of the Trunk.

A natural delivery in trunk presentations is a very unusual occurrence, and one upon which the accoucheur should never rely. It is therefore an absolute rule in practice to attempt to bring one extremity of the fœtus to the superior strait as soon as possible, by resorting either to the pelvic or the cephalic version. (For the divisions, causes, and diagnosis of this mechanism, see *Natural Labor*, page 368, *et seq.;* and for the indications, the chapter devoted to *Version.*)

§ 5. Complicated Presentations.

Under the title of "fallings" (*procidentiæ*), Madame Lachapelle has described the untimely descent of any part whatever of the child, which cannot of itself constitute a particular position on account of its smallness or mobility, but which, however, might complicate the presentation of a more extended region. Thus, the umbilical cord, the feet, or the hands, may individually or collectively come down at the same time as the head or breech. This complication will be very readily detected by the touch, and therefore it is unnecessary to enumerate the peculiar signs that distinguish each of these parts.

We have already spoken of a falling of the cord, and of the means of remedying it. Again, in those cases where one hand has slipped under the head or breech, the labor may terminate alone if the pelvis is well formed and the contractions are strong and continued; and hence we should delay all operations. Even the presence of both hands on the lateral parts of the head has not always proved an [illegible] rmountable obstacle to the spontaneous termination of the labor [illegible] parts have occasionally been expelled together; but if th [illegible] hat contracted and the soft parts resistant, it wo [illegible] te the delivery artificially by the application o [illegible] ding to whether the head has or

---

cess, and craniotomy [illegible] the woman had great need of rest, and the necessary [illegible] e operation was deferred until eight o'clock A. M., when [illegible] lifficulty; for, notwithstanding his dexterity, M. Dubois [illegible] racting the head with the embryotomy forceps.

what consequence is the theoretical impossibility, where positive facts bearing on this point can be adduced, and some of which I have just quoted? But the somewhat material authority of facts is not the only one I might invoke; for does not our reason tell us that, when any of those cases (fortunately very rare) are presented in practice, which seem beyond the pale of all theoretical notions, and in which the practitioner is constrained to do what he can, not what he would, the wisest course is to follow as closely as possible the route traced out by nature? Now, has it not often happened that the labor terminated alone, in the mento-posterior positions of the face, and yet the chin has remained behind throughout? And what has been the mechanism under such circumstances? By consulting the published cases, we shall find that the uterine contraction was incapable of depressing the chin, and has seemed to transfer its action to the occiput; and then the forehead, the vertex, and the occipital extremity, by slipping behind the symphysis pubis, have successively appeared at the centre of the pubic arch. It is not, therefore, logical to recommend an attempt to impress the same movement of flexion on the head, in the hope that the tractions by the instrument, coming to the aid of the expulsory efforts of the womb, would succeed in accomplishing what these latter alone could never effect.

What we have stated respecting the impossibility of spontaneous conversion in direct mento-sacral positions, and of its natural explanation in the diagonal mento-posterior positions, finds here its practical application. The consequence is, that if the chin were turned directly toward the anterior face of the sacrum, we should, before flexing the head with the forceps, impress upon it a slight rotary movement, which would bring the chin to one of the sacro-iliac symphyses, preferably toward the right, in order to avoid compressing the rectum, which is situated to the left.

My own experience, as well as that of others, has so much changed my view in regard to this point of practice, that I willingly admit having been hitherto too exclusive. I believe, therefore, that both methods may succeed in some cases, and it being impossible to determine *a priori* in which one or the other will be more successful, it were prudent to try them successively.

It should, therefore, be well understood that accoucheurs of the present day, drawing encouragement from the successful issue in certain cases of a recent date, are of opinion that the first effort should be to bring the chin under the symphysis pubis.

Again, there are some unfortunate cases in which, after having vainly attempted all the different manœuvres just referred to, craniotomy becomes our only resource.[1]

---

[1] I have quite recently witnessed a case of this nature with Dr. Letannelet, who requested my attendance on a young lady in her first labor. I saw her at eight o'clock in the evening, and detected, as my learned associate had previously done, a right mento-posterior position (the frontal variety): the head had been firmly engaged since three o'clock in the afternoon, and from that hour had not advanced a single line. At eleven, as no change had taken place either in its position or elevation, we attempted unsuccessfully to push it up. Both M. Letannelet and myself tried the lever and the forceps in vain; but before resorting to craniotomy, which was then deemed indispensable, we requested M. Dubois to see the patient. He arrived at one o'clock in the morning, and renewed the attempts that we had before made, without any better suc-

Do not the supposititious cases just given (which could easily be sustained from the facts reported by authors), by rendering us acquainted with the various difficulties that may be encountered in these cases, lead us to adopt, for the mento-posterior position, the rules heretofore laid down by Baudelocque, Gardien, and others, for all face positions? And though, in the present state of our science, the mento-anterior positions should be abandoned to nature, yet does the same rule hold good with regard to the mento-posterior ones? In a word, if this last position be clearly recognized before or shortly after the membranes are ruptured, should we not, prior to the engagement of the face, and while the head is still movable, endeavor to convert it into a vertex position, and thus prevent the difficulties that might subsequently arise? If I had to decide under such circumstances, I would certainly resolve the question in the affirmative.

§ 4. PRESENTATION OF THE TRUNK.

A natural delivery in trunk presentations is a very unusual occurrence, and one upon which the accoucheur should never rely. It is therefore an absolute rule in practice to attempt to bring one extremity of the fœtus to the superior strait as soon as possible, by resorting either to the pelvic or the cephalic version. (For the divisions, causes, and diagnosis of this mechanism, see *Natural Labor*, page 368, *et seq.;* and for the indications, the chapter devoted to *Version.*)

§ 5. COMPLICATED PRESENTATIONS.

Under the title of "fallings" (*procidentiæ*), Madame Lachapelle has described the untimely descent of any part whatever of the child, which cannot of itself constitute a particular position on account of its smallness or mobility, but which, however, might complicate the presentation of a more extended region. Thus, the umbilical cord, the feet, or the hands, may individually or collectively come down at the same time as the head or breech. This complication will be very readily detected by the touch, and therefore it is unnecessary to enumerate the peculiar signs that distinguish each of these parts.

We have already spoken of a falling of the cord, and of the means of remedying it. Again, in those cases where one hand has slipped under the head or breech, the labor may terminate alone if the pelvis is well formed and the contractions are strong and continued; and hence we should delay all operations. Even the presence of both hands on the lateral parts of the head has not always proved an insurmountable obstacle to the spontaneous termination of the labor, for all these parts have occasionally been expelled together; but if the passage be somewhat contracted and the soft parts resistant, it would be advisable to terminate the delivery artificially by the application of the forceps or by version, according to whether the head has or

cess, and craniotomy was then decided upon; but as the woman had great need of rest, and the necessary instruments were not at hand, the operation was deferred until eight o'clock A. M., when it was accomplished with much difficulty; for, notwithstanding his dexterity, M. Dubois had the greatest trouble in extracting the head with the embryotomy forceps.

has not cleared the superior strait; and to bring down the feet in the breech presentations. This latter plan should also be followed if one foot instead of the hand, or if both a foot and a hand accompany the head. Nevertheless, before resorting to an artificial delivery, the accoucheur should always endeavor to push back the hand or foot into the uterus and get it above the head. Most frequently, it will only be necessary to sustain it there during the pain, which urges on the head, to find the latter descending alone and arriving at the inferior strait, and then the labor may be abandoned to nature. We must remark, however, that a foot is far more difficult to return than the hand, and that in consequence of its volume it often constitutes an obstacle which cannot be surmounted by the ordinary resources; wherefore, craniotomy is sometimes indispensable, as several recorded observations fully prove.

A descent of the foot has hitherto only been observed, I believe, in the presentations of the *flexed* cephalic extremity; but I have had an opportunity of meeting with it in a *face* presentation; and the rarity of the circumstance, together with the difficulties that attend the delivery, induces me to narrate it here in detail:

I was suddenly aroused on the 4th of November, 1842, at five o'clock in the morning, by M. X——, a pork butcher in the Rue du Cadran, who came to request my attendance on his wife, who had been in labor for two days previously, under the care of Dr. Lorne, her physician and accoucheur. Having arrived at the bedside of the patient, I learned the state of the case from my worthy associate, after which I proceeded to an examination per vaginam. But before stating its result, I must here transcribe a short account of the case, sent me by M. Lorne himself, who gives the detail, much better than I could (from simple recollection), of what he learned of this woman's previous history, as also an account of what occurred during the labor. He says:

"I was summoned to the Rue du Cadran, No. 7, on the 2d of November, 1842, at six o'clock in the evening, to attend Madame X—— in her confinement. I ascertained from the patient that she had had seven children, and from her account the former labors had terminated in the following manner, namely:

"1. First child: a long and painful labor of three days' duration; presentation of the cephalic extremity; the labor was natural, but the infant died a few days after its birth.

"2. Second and third child: presentation of the pelvic extremity; delivery spontaneous, or by the aid of simple tractions; both children dead.

"3. Fourth child: the uterine contractions disappeared for twenty-four hours after the rupture of the bag of waters; expulsion of the child during the accoucheur's absence.

"4. Fifth and sixth child: presentation of the cephalic extremity; labor long and painful; delivery natural. One of these infants lived a few months.

"5. Seventh child: shoulder presentation and a descent of the arm. M. P. Dubois, having been called in consultation, ascertained the child's death, and performed embryotomy. After the parturition there was an inflammation of one or more of the abdominal organs.

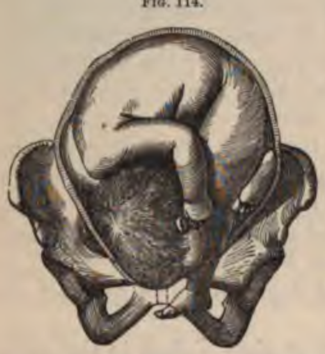
"Madame X—— is thirty-two years of age, is of medium height and sanguineous temperament, and exhibits all the evidences of good health. Nothing in her external organization would lead us to suspect the existence of any deformity of the pelvis, and the normal pregnancy seemed to be at its regular term. The preceding night she experienced some pains, which passed off in the morning, but again reappeared at six o'clock in the evening. I examined her, soon after my arrival, and found the os uteri dilated to the size of a five-franc piece; I readily distinguished the bag of waters, which was relaxed in the intervals, but was tense, and protruded through the uterine orifice during the pain; but I could recognize no part whatever of the fœtus. At midnight the amniotic sac projected into the vagina like a *stuffed pudding*, and descended nearly to the vulva, when it soon ruptured spontaneously and permitted the escape of more than two pounds of the waters. But still I could touch no part of the child, even after the discharge of the waters, at any height within the reach of my finger. Now, however, the scene suddenly changed; for the pains, that were hitherto strong, died away; and as the patient assured me that the uterine contractions had been thus suspended for twenty-four hours in a former labor (the fourth), and afterwards regained a sufficient degree of force to effect the delivery, I had her replaced in bed.

"I found the woman in the same condition at eight o'clock in the morning of the next day, the 3d of November; some pains were perceptible in the left groin and flank, but the parts of the fœtus were still inaccessible. . . . . No notable change occurred in the course of the day. Nine P. M.—I recognized the left leg and foot lying across the os uteri at the superior strait; the pains were very strong, though they had not the characters of the expulsive ones.

"Nov. 4th, the pains were stronger, but the labor did not advance. As the os uteri was sufficiently dilated, I concluded to search after the second foot, but it proved to be rigid, and would scarcely permit the hand to enter. I found a hard and rounded tumor just above the foot first detected, which I suspected to be the head. But after making some vain attempts to push it up, and to find the right foot, I sent for M. Cazeaux."

Having received this history of the case, I proceeded to an examination of the state of the parts. I found a foot at the upper portion of the vagina, which proved to be the left one, with its heel directed backwards, and a little to the right; then, by passing my finger behind the symphysis pubis, I detected a voluminous tumor, which was pressed so forcibly against the anterior arch of the pelvis, that I could not insinuate the finger between it and the pubic symphysis; at first, I thought it was formed by the right buttock, and I diagnosticated a right posterior position of the breech, with the left limb doubled up on the anterior part of the belly, and the other, on the contrary, stretched out along the abdominal and thoracic plane of the child. The contractions again became strong and energetic, but, notwithstanding the complete dilatation of the cervix, the presenting part did not engage. While searching for the cause of this delay, I carefully examined the pelvis, and detected a considerable prominence of the sacro-vertebral angle, whereby the antero-posterior diameter was reduced to three inches and one-eighth at the most. I then resolved to draw on the foot, but, to my great surprise, these tractive efforts proved wholly ineffectual. By again placing my hand on the tumor, that I had originally taken for the anterior buttock, I found it to be harder and much more voluminous than I had at first supposed, and I recognized it as the head, surmounted by a large and soft tumor, or *caput succedaneum*. I tried in vain to find the sutures and fontanelles; but, by gently slipping the fingers between this tumor and the leg belonging to the presenting foot, I felt a very irregular surface, and soon after recognized distinctly the eyes and eyelids, and then the other signs of a face presentation. It was, in fact, an irregular presentation of the face, in which the chin was directed backwards and to the left, and somewhat engaged at the superior strait (a left mento-iliac position, and the head not completely extended: or, in other words, Baudelocque's fourth position of the forehead). To sum up, I was in attendance on a woman whose sacro-pubic diameter was but three inches and one-eighth at the outside, and whose fœtus was presenting in an irregular or frontal variety of the left posterior mento-iliac position, and this complicated by a descent of the left foot; besides which, the waters had been entirely evacuated for thirty-two hours, and the uterus was strongly retracted. I was not discouraged, however, by all these difficulties; my first thought was to push up the foot that had become engaged under the head, but all such efforts proved abortive; I then applied (though not without some trouble) a fillet on the foot, and endeavored to press back the head, while drawing at the same time on the fillet; but this was equally unsuccessful, for the head was firmly sustained by the powerful contractions of the womb, and did not move. As the child was still alive, I next decided on the application of the forceps. The introduction of the blades and their articulation were effected both without difficulty and without much suffering to the patient, and they were placed on the sides of the pelvis; but, notwithstanding the most powerful tractions, which were kept up for half an hour, I could not make the head advance in the least degree. After resting for a few moments, I withdrew the instrument in order to reapply it, and this time I was fortunate enough to place the blades directly on the sides of the head; I then communicated to the handles a slight rotary movement, so as to get the face in a transverse position. But all proved ineffectual, for I drew with all my force, and M. Lorne succeeded me; both of us exhausted our strength to no purpose, and I then withdrew the forceps, and permitted the woman to rest for an hour. Having decided on a resort to craniotomy, if a third application should be equally unsuccessful, I requested my associate to go during this interval after Smellie's scissors, and the embryotomy forceps. An hour afterwards the common forceps were again introduced and easily applied, and tractions on

FIG. 114.



The left posterior mento-iliac position complicated by a descent of the left foot.

the fœtus were once more made by M. Lorne and myself for half an hour without any better success.

Being then fully convinced of the impossibility of a natural delivery, and of the impotence of our efforts; as also that, notwithstanding the existence of the heart's pulsations, the unusual delay in the labor (thirty-two hours after the amniotic sac was ruptured), and the compressions made by the instrument, must have necessarily compromised or even destroyed the viability of the fœtus, and having only to choose between a bloody operation on the mother or a mutilation of the child, I resolved on the performance of embryotomy. Smellie's scissors, covered at their points by a little pellet of wax, were guided along the palmar surface of my left hand, and directed perpendicularly on the head, where they had to penetrate through the soft parts to the depth of nearly an inch before meeting with any resistance from the bony vault; I then rotated them, and they entered into the substance of the brain without difficulty; I next opened the blades in two different directions, so as to make a crucial incision, the radii of which were about half an inch in length; then penetrating still deeper into the cerebral substance, I worked the scissors in various directions so as to break up the brain. The male and then the female blade of the embryotomy forceps were next introduced, and locked without any trouble, as also without pain to the patient. The articular part touched the vulva. By aid of the vice, I next closed the instrument, leaving only a space of about one inch between the ends of the handles, and tractions were then made; but I soon found the blades slipping. It was necessary to begin the operation anew, and the same accident occurred again. The third time the slipping commenced, and I only succeeded in arresting it by suspending the tractions, and closing the forceps more firmly, when the head was finally extracted; but the chest was arrested at the superior strait, and considerable efforts were still necessary for the extraction of the rest of the trunk. The delivery of the afterbirth, being immediately effected, presented no particular difficulty.

In a case of twin labor, the particulars of which were communicated to me by Dr. Leflem, of Pontrieux, the second child presented in a mento-pubic position, complicated with procidentia of the right foot and right hand, the heel of the foot being turned toward the pubis. It is true, that since an attempt to turn had been made by a midwife, it is impossible to know whether these situations of the hand and foot were spontaneous, or the result of awkward manipulations. However this may be, M. Leflem found it impossible either to push up the head or to use the forceps with advantage. Not having the proper instruments for performing embryotomy at hand, he was obliged to leave the patient for a few hours, and on his return he found that she had expired.

It is possible that, if, after having discovered the impossibility of turning occasioned by the contraction of the uterus, bleeding to syncope had been practised, or if the state of the patient did not allow of this, large doses of opiates or anæsthetics had been administered, the patient might have been delivered.

The unfolding of the lower limbs in the positions of the pelvic extremity, and the stretching out of the arms in that of the shoulder, are merely concomitants of the principal presentation, and should not be looked upon as an unfavorable complication. The extension of the arm, or the presentation of *the hand or arm* of certain authors, has been considered by them as one of the gravest complications of labor ;.but it has already been shown, in the article on Spontaneous Evolution, that a descent of the arm rather favored this latter process than otherwise; and we shall hereafter see that it is only from circumstances foreign to the presence of the arm itself, that the version is at times rendered more difficult. (See *Pelvic Version.*)

ARTICLE III.

DISEASES OF THE FŒTUS.

The diseases of the child, to be mentioned in this connection, are those which, by sensibly augmenting the size of one of its parts, create an obstacle to its passage through the pelvic canal. We have, therefore, to treat of hydrocephalus, hydrothorax, ascites, and the accidental tumors that may have been developed on various portions of its body, during the intra-uterine life.

§ 1. HYDROCEPHALUS.

Under this term are included all the dropsies of the head, and all the effusions or infiltrations of serum within or exterior to the cranium.

Hydrocephalus has been described by authors as external or internal, according to the seat of the effusion; placing under the former variety all the serous or sero-sanguinolent infiltrations that are found beneath the scalp or pericranium. This latter affection has never hitherto been considerable enough to constitute an insurmountable obstacle to parturition. In fact, it is usually associated with a state of general œdema that destroys the fœtus at an earlier period of gestation; and, consequently, its expulsion is effected without difficulty, whatever may be the thickness of the scalp. I saw a seven months' child, at La Clinique, in 1838, in whom this part was a finger's breadth in thickness, and the mother also was quite œdematous; the labor terminated without difficulty. Desormeaux speaks of two very similar cases.

I do not know that the records of science furnish a single case of external hydrocephalus formed by a true collection of fluid, yet I have seen two cases of this kind of effusion. The subject will be referred to, presently, in greater detail.

Hydrocephalus internus, the only variety requiring a particular description, is such a rare disease, that Madame Lachapelle observed but fifteen cases of it in forty-three thousand five hundred and fifty-five labors.

In the estimation of pathologists, this is always a grave affection, on account of the danger to which it exposes the child after birth; but more particularly so, in the eyes of the accoucheur, from the difficulties thereby entailed on the labor itself. Moreover, these difficulties and dangers vary with the quantity of liquid effused into the cranium; because, where this is inconsiderable, the delivery is still possible, owing to the flexibility and the softness of the head, the walls of which are nearly all membranous; so that, by gradually moulding itself to the passage, the head becomes lengthened out, and the labor is either terminated by the powers of nature alone, or else is effected without much difficulty by the application of the forceps, or by the pelvic version; but where the water exists in great abundance, the dimensions of the head exceed those of the diameters of the pelvis[1] so much that the delivery is absolutely impossible, unless the fluids be evacuated by an artificial puncture, or by a spontaneous rupture of the sutures, or fontanelles.

The following, according to Dugès, are the signs whereby a dropsy of the head may be recognized during the parturition: the finger falls upon a large and slightly convex surface, which covers every part of the superior strait without engaging, and has a variable consistence at different points; for, although hard and resistant while the pain lasts, it is, on the contrary, soft and fluctuating in some places during the interval between the contractions. Then, by passing the index regularly over it, the accoucheur can recognize pieces of bone separated by membranous interspaces, or soft commissures, as broad as the finger; and, at times, the fontanelles, equal in extent to the hollow of the hand. If the child has presented by some other part than the vertex, and the head is only accessible to the touch by its base, the separation of the bones detected by the finger will be much less, though it is often easily appreciable. Finally, if the dropsy be inconsiderable, the same characters will be observed, though they are less evident; and besides, the head being then more convex, and not so soft, will engage better in the pelvic excavation.

The diagnosis is sometimes rendered difficult by the elevation of the head; but when the latter is ascertained to be presenting, and the pelvis found to be well formed, the presence of the pulsations of the fœtal heart on a level with, or even above the umbilicus, may excite a suspicion of hydrocephalus. (Blot.)

According to Dugès, the signs furnished by the touch are not always to be met with, and I have seen two cases in which they were entirely wanting. These two cases, which, if my investigations are to be relied on, are unique, present instances of hydrocephalus with double effusion, viz., intra-cranian and extra-cranian.

A well-formed woman who had once been safely delivered was again in labor under the care of Dr. Bassereau. Thirty-six hours had elapsed when the Doctor called me in consultation. By this time the neck was completely dilated and the membranes ruptured, but the pains which were for a long time powerful had gradually lessened, so that the labor was almost suspended.

I discovered at the superior strait a large and soft tumor, offering none of the characters of the head, but suggesting rather a presentation of the breech. During the contractions it became tense and elastic, but was devoid of bony resistance. Upon introducing the entire hand within the vagina and grasping the tumor, I was able, by making unequal pressure upon various points of its surface, to perceive here and there a sense of fluctuation, and I knew that I had to deal with the head covered by a sac containing fluid. I then remembered having ten years before met with a similar state of things, and confidently diagnosed external hydrocephalus coincident, doubtless, with effusion within the cranium.

---

[1] In a case reported by Wrisberg, the child's head was ten and a half inches long, and thirty-two inches in circumference. Meckel has the skull of a hydrocephalic infant whose transverse diameter is sixteen and a half inches, and its height, taken from the occipital foramen to the vertex, measures sixteen inches; and Burns gives a case of hydrocephalus, where the circumference of the head amounted to twenty-three inches.

Nothing was revealed by auscultation. The child had ceased to live. An incision, one-eighth of an inch in length, was then made upon the top of the tumor, and about a glassful of liquid escaped. The soft and fluctuating tumor disappeared and the scalp alone remained between my fingers and the bones of the head.

The forceps were applied, but without effect, and three-quarters of an hour afterwards I decided to make another puncture; this time a quart of liquid escaped, and shortly after the head engaged, and delivery was spontaneously accomplished.

Ten years before, I was called by Dr. Saint Ange to a woman who had been in labor thirty-six hours, and in whose case various stimulants, amongst them, ergot, had been vainly employed. At the commencement of the labor my confrère had detected a vertex presentation, but feeling a large and soft tumor, I at first thought of a presentation of the breech. During an interval between the pains I pressed suddenly upon the tumor, and clearly distinguished the resisting surface of the bones of the head.

The forceps were twice applied in vain, when a puncture was made, giving issue to two glassfuls of liquid. The forceps were applied once more, and a dead child easily brought away.

The sutures were large, and within the cranium there was a collection of fluid which escaped upon an incision being made through a suture. There was, therefore, in this case, both internal and external hydrocephalus.

It were unnecessary to say how greatly this anomaly must modify the diagnostic signs pointed out by authors. Nothing but a sudden pressure upon the tumor, dispersing the extra-cranian fluid, will enable us to feel the bones of the head.

How, next, are the two collections of fluid to be explained? 1. It may be supposed that both are formed separately, one by pressing away the subcutaneous cellular tissue, and the other taking place in the intra-cranian cavities. This, however, is hardly probable; but, 2. It is possible that before labor the internal hydrocephalus alone was present, and that under the influence of the various kinds of pressure undergone by the head, necessarily unequal and partial as they must be from the very form and dimensions of the pelvis, it is possible, that under these circumstances a fissure might occur somewhere in a suture or fontanelle, allowing the liquid to pass from within outwardly and to form a tumor upon the external surface of the cranium.

The latter theory receives confirmation from the fact that, in the second case, M. Martin Saint Ange had no difficulty in detecting the head early in the labor, whilst at a later period I discovered it with difficulty, masked as it was by a soft and fluctuating tumor. But, supposing a communication between the two collections, how explain why the evacuation of the first was not followed by the emptying of the latter? how account for the necessity of a double puncture in the first case and the persistence of the internal hydrocephalus in the second, even when the head was subjected to strong compression by the forceps? The fact merits further examination; but however the mode of its formation be explained, it is not less curious as respects both diagnosis and operative indications.

The indications for treatment presented by this affection vary with its extent, and according to whether the child is living or dead. Besides which, as Dugès justly remarks, the physician must not only base his determination on the size of the head, but also on its flexibility and its inclination to engage in the excavation.

When the cranium is of moderate size, is soft, reducible, and, from the influence of the strong, energetic contractions of the womb, gradually approaches the inferior strait, we should temporize, and be satisfied with favoring a spontaneous termination of the labor by the employment of the proper means. But if the delivery is delayed, and the pains are weakened or uselessly spent against insurmountable obstacles, the forceps should be at once applied. Nevertheless, the pressure and tractions on the head ought to be slow and gradual, with the view of preventing rupture, which can always be avoided by proceeding with gentleness, and remembering that the instrument is liable to slip.

Breech and trunk presentations are much more common when the fœtus is hydrocephalic, as shown by statistics furnished by Scanzoni; of 152 cases, 30 presenting some other part than the head, or 1 in 5. Now, under these circumstances, it is evident that the difficulties will not be felt until after the spontaneous exit or the artificial extraction of a great part or even the totality of the trunk, for then it is that the occipito-frontal circumference considerably enlarged engages in the superior strait.

The pelvic version would doubtless be resorted to in presentations of the trunk; but if the operator has been fortunate enough to detect the large size of the head before searching after the feet, he should, in my opinion, endeavor to bring the cephalic extremity to the superior strait.

When the size of the head is such that a spontaneous delivery is wholly impossible, and the application of the forceps or the pelvic version is not practicable, there is no other resource for saving the mother than to puncture the cranial vault, which alone can afford an outlet to the serum accumulated in its cavity. This operation may be performed with the trocar, the bistoury, or with any pointed knife whatever, after having taken the precaution to envelop its blade with tape, so as to leave only the point uncovered. This simple puncture of the membranous intervals is always preferable to the mutilation of the child. For, although the sudden collapse of the brain, which usually follows the evacuation of the liquid, nearly always occasions the death of the fœtus, still the latter may possibly survive such an operation; since a puncture of this kind made after birth has occasionally been followed by a complete cure. Smellie's and Stein's scissors should, therefore, be proscribed in these cases, and we ought to decide on plunging them into an intact brain only, when the opening made with a smaller instrument has not been free eno[illegible]o permit the escape of the liquid. It may happen, in cases of double hydrocephalus, that when the external fluid has been evacuated through a puncture, the labor may terminate either spontaneously or by the use of the forceps. Should it be otherwise, another puncture through the sutures or fontanelles will evidently be called for. In no case is a bloody operation on the female permissible, because the life of the infant is then too seriously compromised, by the mere fact of hydrocephalus, to think of sparing it at the expense of that of the mother.

Where the child is dead, cephalotomy would appear to us preferable, unless some serious difficulties in its performance were likely to be met with.

If cephalotomy be decided upon in cases of pelvic presentation, some difficulty may be experienced in perforating the cranium. Though it is often possible to pass the instrument through the arch of the palate, I would prefer repeating what I have already done in a case to which I had been called in consultation by M. Ducros, namely, to introduce the blunt hook into the orbit, and enter the cranium through the optic foramen. This process had been before recommended by M. Dujardin in a note addressed to the Academy of Medicine in 1851, but it is evidently practicable only when the child is dead.

[Hydrocephalus becomes a more serious matter when the breech presents, inasmuch as the true nature of the case is liable to escape detection. Again, supposing the diagnosis made out, perforation of the cranium is performed with difficulty, on account of its being accessible only by its base. In a case of this kind another course might be pursued, viz., to open the spinal canal by an incision between the spinous processes of the vertebræ, and through the passage thus made introduce a gum-elastic catheter provided with its wire. This is to be pushed into the cranium until it meets the water, which may then be discharged. The head will collapse immediately, and no further difficulty be found in its extraction. In my thesis for the Concours, I reported several cases in which this operation was successful. (Tarnier, *Thèse de Concours*, 1860.)]

§ 2. HYDROTHORAX AND ASCITES; RETENTION OF URINE.

Ascites is even more rare than hydrocephalus, though it is met with somewhat oftener than hydrothorax. The signs indicative of dropsy of the chest are, a considerable enlargement of the thorax, a widening of the intercostal spaces, and an evident fluctuation in these enlarged intervals. On the contrary, the extraordinary size of the belly, the distention of its walls, and the fluctuation detected there, characterize ascites. The fœtus, being retained by the amplitude of one or the other of these cavities, is arrested in its progress through the pelvis, and the accoucheur finds the excavation filled up by a large, soft, and fluctuating tumor. In some cases of extreme distention of the abdomen, the walls of this cavity have been found to yield, so that a great part of the tumor remained above the superior strait, whilst the rest of the trunk gradually descended into the excavation; and when one portion of the abdomen had reached the exterior, the liquid gravitated towards this point, where the resistance was less, the portion remaining internally progressively diminished in volume, and the labor terminated naturally. Frank speaks of a dropsical child that presented by the breech, in whom a quantity of the serum had escaped from the abdomen into the scrotum; and an evacuation of all the liquid was secured by making an incision into this part, which course should be repeated, if a similar case were to occur. But when the aqueous tumor of the chest or abdomen is large enough to be arrested by one of the straits, we should have recourse to puncture with the trocar.

A peculiarity which might readily be mistaken for ascites, consists in the accumulation of a large amount of urine in the bladder of the fœtus.

When treating of the secretions of the fœtus, it was stated (see p. 237) that a certain amount of urine was doubtless secreted during its intra-uterine existence, and we mentioned in support of the opinion, some instances in which obliteration of the urethra had given rise to enormous distention, and even rupture of the bladder. In a case communicated to the Academy of Medicine by M. Depaul, the bladder was so distended as to prove an insurmountable obstacle to the extraction of the fœtus.

[This case, conjoined with two similar ones, supplied M. Depaul with the material for an excellent paper, published in the *Gazette Hebdomadaire* of 1860. The Professor thinks that retention of urine has often been mistaken for ascites, which, according to him, is very rare. For further particulars the reader is referred to the paper above mentioned.]

Whether aware of the true cause of the difficulty, or hesitating between ascites or extreme distention of the bladder, it is evident that if properly directed tractions are ineffectual, an evacuation of the fluid is the only resource in either case. We would merely add, in accordance with M. Depaul, that since the permeability of the urethra may sometimes be re-established after birth, it is strictly indicated to perform the puncture as carefully as it would be done in the adult. The insertion of the cord would be a sure guide in choosing the most favorable point.

In a case observed by M. Moreau, ascites and considerable distention of the bladder existed simultaneously. The first puncture, though it discharged a large amount of peritoneal fluid, did not enable the extraction to be made, and a second one was necessary to evacuate the urine contained in the bladder. The delivery of the child was effected without difficulty immediately afterward.

§ 3. Emphysematous Condition of the Fœtus.

Merriman has remarked that, when the fœtus had been dead for some time, a large quantity of gas may be created in consequence of the putrefaction it has undergone; thereby greatly augmenting the volume and the distention of the belly, and consequently retarding the expulsion. "I have known," says he, "two instances of rupture of the vagina, arising from the rashness of midwives, who forcibly dragged the children, enormously swelled with putrid air, into the world. In one case, the vagina was torn completely through. Both the women died in a few hours. Had the bellies of the children been punctured, to give vent to the air, these fatal occurrences would have been avoided." (*Synopsis.*)

M. Depaul has recently published a case, in which not only was a large quantity of gas developed in the abdominal and thoracic cavities, but the limbs of the child were so greatly infiltrated as to present nearly double their natural size. After extracting the head by the forceps, it was deemed necessary to apply the cephalotribe forceps, and close them with such force as to reduce the size of the trunk considerably, and at the same time obtain a firm hold for traction. Whilst proceeding thus, a large amount of exceedingly fetid gas escaped with a report, and very strong tractions were required to disengage the chest and deliver the child. The uterus in contracting expelled a similar kind of gas.

Supposing the diagnosis to be well established, we agree with Merriman in the opinion that a previous puncture of the abdomen and chest would certainly have facilitated the use of the cephalotribe, or perhaps have even rendered its employment unnecessary.

§ 4. Tumors of Various Kinds.

The tumors, of divers sorts, with which the fœtus may be affected at the time of birth, and the size of which is occasionally so great as to impede its spontaneous expulsion, are not susceptible of being included under any general head, and the measures to be employed vary for each. Where they are pediculated, it not unfrequently happens that the pedicle is broken, either by the influence of the expulsory efforts of the womb, or the tractions made by the accoucheur. When their induration is not very great, they temporarily disappear, at times, from being compressed between the fœtal surface and the uterine parietes, or the osseous walls of the pelvis. The proper course is to remove them, when accessible, or to discharge their contents by means of a puncture where they contain a liquid. But, unfortunately, we can seldom even suspect their existence until the labor is already so far advanced that it is hardly possible to act. If their volume be excessive, the child's death will nearly always result from the delay and difficulty in the parturition, and then the conduct to be followed is clearly evident.

Certain tumors are also sometimes present in the great cavities, especially that of the abdomen, which may render spontaneous delivery difficult, and occasionally even impossible. A very curious case is mentioned by MM. Guilleton and Ollier, in which the obstacle to delivery was occasioned by an abnormal enlargement of both kidneys, due to an hydatiform hypertrophy of the glandular element of the Malpighian bodies. Tractions so strong as to tear away the lower extremities of the child failed to deliver it; but fortunately the pains returned, and the labor terminated spontaneously in a few hours.

In another case, quoted by Siebold, the child had presented by the pelvis, though the head was the first to appear, and was expelled without much trouble. The delivery of the body, however, required strong and long-continued tractions. The size of the abdomen was enormous; it measured seventeen inches in circumference, and eight inches from the xyphoid cartilage to the pubis. At the autopsy, the kidneys appeared as two large tumors, weighing two pounds; each one was six inches long, four inches wide, and three inches thick. (See, in the *Journal Hebdomadaire*, 1855, the bibliographical reference to several similar cases; see also Tarnier, *Thèse de Concours.*)

Still another case of dystocia, due to the enormous bulk of a cancerous liver, is reported by M. Noeggeralt. Though the forceps were applied, the extraction of the head required the entire strength of the operator; and even then the pains, though very powerful, failed to deliver the shoulders; so that, having dragged fruitlessly upon the head, it was necessary to hook the fingers in the axillæ, and draw upon them forcibly.

The principal bulk of the fœtus was due to the abdomen, which had four times its normal size. An immense tumor, the liver, filled its cavity; it weighed two and a quarter pounds, measured eight and three-quarter inches in width, six inches from below upward, and three inches in thickness. The tissue proper of the liver was met with here and there, but the greater part of it was replaced by a heteromorphous mass resembling the gray substance of the brain.

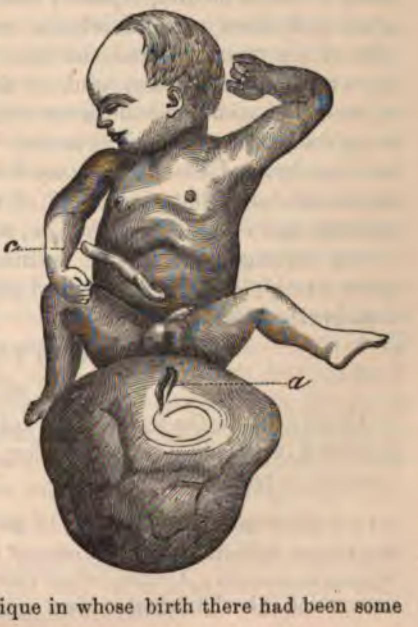
[Various other tumors have been met with on the head, neck, and lumbar and sacral regions.

Tumors of variable size are sometimes developed upon the head, the most common being encephaloceles and meningoceles. The latter variety occur more frequently than the former, and sometimes acquire a volume equal to or greater than that of the head itself. In a case of the kind which I saw at the hospital of the Clinique, the child presented by the shoulder. Whilst turning, I felt a round and resisting tumor by the side of the head which I took for the head of another child. The operation was continued and the feet brought down. At first, the extraction was easy, but when the body had been delivered I encountered an unusual difficulty in the extraction of the head. It came down, however, suddenly, whilst drawing upon it, and with it a large tumor attached to the occipital region. A plaster cast which I had made of it is now deposited in M. Depaul's anatomical collection in the hospital of the Clinique. Dissection proved the tumor to be a meningocele.

Large tumors may also be attached to the neck, as in a case of dystocia published in the *Archives* by M. Monod where the tumor, as large as the head of a child at term, was attached to the neck by a pedicle which allowed it to turn to either side. The vertex presented, and after twenty-four hours of labor it became necessary to apply the forceps. The child, though born alive, lived but five hours. In this case, the tumor appeared to be cancerous. At other times, the neck is affected with a tumor formed by an hypertrophied thyroid gland. In a case of the kind which I saw quite recently, the tumor was of the size of the fist.

The scrotal, sacral, and lumbar regions are quite frequently occupied by large tumors, such as hydroceles, spina bifida with hydrorachis, cancer and fœtal inclusion, all which may cause greater or less difficulty in the extraction of the child. M. Depaul relates, in a note, that he saw two children at the Clinique in whose birth there had been some

FIG. 115



difficulty, and which had between the thighs an oval-shaped tumor almost as large as their respective heads. It was entirely distinct from the genital parts, arising from and seeming to lose itself in the deep-seated cellular tissue of the perineum. Careful dissection proved it to be composed of encephaloid matter.

Spina bifida with hydrorachis may affect the entire length of the spinal column, though it is only when it affects the lumbar region that it is liable to form a tumor large enough to interfere with delivery. I reported two cases in my thesis for the *Concours*, one of which was furnished me by M. Guibout. For a drawing of it, see Fig. 115.

A tumor in the scrotal or sacral region, large enough to require active intervention, may be due to fœtal inclusion. Several cases of the kind may be found in a paper published by Dr. Constantine Paul; and my colleague M. Joulin also devoted a long chapter to it in his thesis for the *Concours*, (Paris, 1863).]

In cases like these, the difficulty cannot be foreseen, nor even suspected, until it begins to exert its influence upon the labor. Tractions upon the head, arms, or axillæ, when the head presents, and upon the lower extremities under other circumstances, should be made at first moderately, and afterwards strongly; but, should they fail and the child be dead, it were better to perform embryotomy than to continue them so long as to risk laceration of the maternal organs. Evidently, if the tumor contain a fluid, the first thing to be done would be to evacuate it by one or more punctures.

§ 5. ANCHYLOSIS OF THE FŒTAL ARTICULATIONS. GIBBOSITY.

Dr. Busch has recently had an opportunity of observing a very singular case of dystocia, dependent on anchylosis of the articulations of the child's limbs, in which the forceps were applied, but after the extraction of the head, the trunk could not be delivered. Being unable to discover the cause of the difficulty, repeated tractions were made, at first moderate, but afterwards more powerful, when a cracking noise was heard, and the upper part of the trunk cleared the external orifice; but the lower portion of it likewise became arrested, and, as the child was dead, it was dragged out without hesitation, and the same cracking sound was again heard. At the autopsical examination, it appeared that the articulations of the limbs had been anchylosed in the ordinary flexed position exhibited by the fœtus in the womb, and that the bones of the arms and thighs were fractured. (*British and Foreign Med. Review*, p. 579, April, 1838.)

Our colleague Dr. Joulin mentions several other similar cases. Still more rarely is delivery made difficult by deformity (gibbosity) of the vertebral column.

ARTICLE IV.

FŒTAL MONSTROSITIES.

As the cyclops, the anopses, the acephalous and anencephalous fœtuses are delivered as easily as those having a normal conformation, we have no occasion to treat of them here.

[We would merely remark that in these cases, the diagnosis of the presentation is rendered difficult by the deformity of the parts with which the finger endeavors to come in contact. Anencephalous cases, however, afford certain peculiar indications which it is of interest to know. Whenever the finger touches the presenting part, the fœtus is affected with convulsive and irregular movements which soon attract attention; the motions being probably due to direct irritation of the stump which is generally surmounted by the hairy scalp in cases of this kind. By this sign I was enabled to diagnose an anencephalous fœtus before the membranes were ruptured, to the great astonishment of the students at the hospital of the clinic where the labor occurred.]

ARTICLE V.

DYSTOCIA OCCASIONED BY MULTIPLE FŒTUSES.

§ 1. OF MULTIPLE AND INDEPENDENT FŒTUSES.

We pointed out the signs, in the article on gestation (see page 270) by which the presence of two or more children in the uterine cavity might be recognized during pregnancy, and described normal twin labor in another chapter (see page 375). It is now our duty to indicate the difficulties peculiar to this form of labor.

Usually, as was stated, the birth of the second soon follows that of the first, but if delayed, friction over the body and upon the neck of the womb are sufficient to stimulate contractions which soon complete the delivery. Generally, therefore, the action of the womb must be waited for patiently. (See page 377.) But is the labor to be abandoned wholly to nature, or should we attempt to deliver at once? In some instances, there can be no hesitation as to the proper course; thus, when the birth of the first child has been tedious and difficult, and has required the intervention of art, and the forces of the patient seem to be exhausted by the former effort; when any accident whatever that threatens the life of the mother or of the second twin, has occurred during or after the delivery of the first; and whenever the second one presents in such an unfavorable position[1] at the superior strait as to demand the pelvic version, this ought to be performed immediately. But in all these cases the expulsion should by no means be rapid, and the accoucheur will draw very slowly on the pelvic extremity, so as not to empty the uterus too soon, and thus avoid the inertia and attendant hemorrhage which might result in consequence of a rapid depletion. It would even be prudent, when the defective position shall have been converted, by the evolution, into a presentation of the pelvis, to trust the rest of the delivery to the expulsory efforts of the womb. The application of the forceps will rarely be necessary, because, if the head is so far engaged as to render pelvic version impossible, the labor will probably terminate without assistance. Nevertheless, should the incapacity of the uterus be complicated with any accident serious enough to compromise the life of the mother or child, it would be proper to have recourse to this instrument if the head had arrived at the inferior strait; but in all other cases the pelvic version ought to be preferred, because the introduction of the hand and the evolution of the fœtus will not fail, by the irritation they produce, to determine the retraction of the uterine walls, and thus prevent subsequent inertia.

When one of the twins, though dead, has remained in the uterus for several months, whilst the development of the other was constantly progressing, the little abortion is ordinarily expelled simultaneously with, or shortly after, the first child; but unless the accoucheur is very careful, and the size of the womb after the delivery should not excite his attention, its sojourn there may be considerably prolonged. No doubt, in these cases, the hand ought to be carried up into the womb, for the purpose of delivering the aborted fœtus, but this will not always prove an easy matter. In a case of the kind, communicated to me by Dr. Casaubon, the internal uterine orifice became strongly contracted immediately after the extraction of the placenta, and it was not without great difficulty that he eventually succeeded in overcoming its resistance, and reaching the uterine cavity. The little product was then removed, and proved to be an abortion of four months. The other infant had arrived at the end of the eighth month.

---

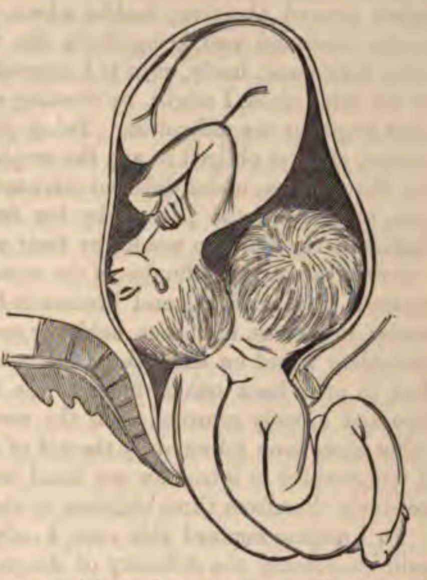
[1] It is not very unusual to find the second child presenting by the shoulder; which is probably owing to the vacuum in the womb after the expulsion of the first one, a void that singularly facilitates the displacement of the second.

In certain cases, the presence of two children may render the delivery difficult, and require some special precautions; thus, it may happen: 1. That both present simultaneously at the strait, and retard each other's expulsion; here the most movable head should be carefully pushed up, so as to permit the other to engage first. The difficulty will be greatly enhanced if the two heads be engaged in the excavation at the same time, and neither of them can be pressed back; under such circumstances, the application of the forceps upon the one that appears the most engaged, and, if this does not succeed, the perforation of one of them, seem to me the only practicable operations. However, even here, very prompt action is unnecessary, for it might happen, if both heads were small, that a natural expulsion could be effected; an example of which is reported by Allen, in vol. xii. of the *Medico-Chirurgical Transactions*. The same plan is to be pursued when, instead of the heads, the breech or the feet of the two infants present together.

2. The first child may present by the shoulder; here, the pelvic version is evidently indicated, but in performing it the operator must be very careful to seize the feet of the right child before commencing the evolution, for if both the bags of waters were ruptured, nothing would be more easy than to get hold of two feet belonging to different children. It were much better to turn by drawing on one foot only. (See *Version.*)

3. Where the first presents by the feet, whether spontaneously or as a consequence of the pelvic version, the greater part of the trunk is extracted without difficulty, but the head may be arrested in the excavation or above the superior strait. Thus, in the twentieth observation of the fourth Memoir of Madame Lachapelle, the head of the first-born had drawn under it that of its brother, which had a tendency to present by the vertex, so that the latter one blocked up the passage of the former, while the first prevented the second from getting above the superior strait; but, fortunately, the children were small, and the head of the second twin escaped spontaneously, alongside of the neck of the first, and then the head of the first followed the neck of the second. A very similar case, given by Dr. Erwin, is related by Dr. Dewees. (Just such a case is represented in Fig. 116.) Had these two fœtuses been of the ordinary size, it is clearly evident that their expulsion could not have been effected until one or possibly both heads had been reduced by craniotomy. The mutilation of one child seems to me the only

Fig. 116.



recourse we have in these difficult cases; thus, it has properly been recommended to amputate the neck of the first twin, which would render the spontaneous expulsion of the second one possible, or at least would permit its extraction by the forceps; after which, the head of the mutilated infant should be sought after and brought down. However, before resorting to this cruel operation, an application of the forceps ought to be attempted on the head that descended first, as appears to have been done successfully by a surgeon of Dijon. In fact, from the smallness of the children, it is possible that, in many cases, the second head will afford but a feeble obstacle to the passage of the trunk of the child we are endeavoring to extract by the instrument.

4. M. Jacquemier relates a curious case witnessed by him at the Maternity Hospital. A woman, who had been in her labor nine days, was brought to the hospital in a dying condition; the waters were discharged three days before, and the forceps had been applied without success. At the autopsy, two children were found in the womb. One head had descended into the excavation in the left occipito-cotyloid position, and had passed the uterine orifice. The other child was in the second position of the left shoulder; its head rested in the right iliac fossa, and the front of its neck, which was situated below the anterior shoulder of the first fœtus, embraced the neck of the latter, in a semicircle, so as to prevent a further descent of the trunk; thus explaining the fruitlessness of the tractions made by the forceps. Both children were large.

5. Again, two feet occasionally present at the orifice; when, if the accoucheur deem it advisable to aid the expulsory efforts of the womb by tractions, he might, by supposing they belonged to one child, draw on both, and thus engage parts of both twins at the same time, which could not pass out together; therefore, if there is the least doubt of the character of the pregnancy, he should ascertain, before making any tractive efforts whatever, that the two limbs really belong to the same individual, which is done by passing the hand up into the womb as far as the hips; though it must be confessed that this diagnosis is frequently attended with great difficulty. Here, again, it is better to draw upon one foot only.

Pleissman states that, on one occasion, he found the orifice plugged up by the parts that had become engaged, and which at first sight appeared to him to be *a quantity* of hands and feet. A more careful examination enabled him to distinguish four inferior extremities, which were delivered as far as the ham, and one arm. "At first," he says, "I was in great perplexity, because I could find no way of introducing my hand into the womb, for the purpose of distinguishing and seizing the two feet belonging to each child, and because all my efforts to make even one of these extremities go back again proved abortive; besides which, in drawing on any two of them, I might confound and bring down the feet of two different fœtuses at the same time; and, lastly, even if I succeeded in seizing the two feet belonging to the same child, I might, by drawing on them, engage the other parts, and thus augment the difficulties. Being greatly embarrassed as to the proper course, and yet obliged to act, the employment of a measure recommended by Hippocrates, under different circumstances, happily suggested itself; it was, to suspend the patient by her feet, hoping that the heads and the bodies of the children would, by their weight, draw one or more of the extremities towards the fundus of the womb, which was still distended by the waters. The husband and brother-in-law of the woman passed their arms under her hams, and thus held her suspended, so that only the head and shoulders rested on the bolster. I intended, as soon as I mounted on the bed, to press back one or more of the free extremities into the womb, but two had already returned from the mere position of the mother, and the other three soon followed by the aid of my fingers. Immediately afterwards, I was enabled to introduce my hand into the uterus, and to withdraw successively therefrom three children by the feet."

In bringing forward this case, I only desire to illustrate what has been said concerning the difficulty of diagnosis. I ought also to call attention to the impossibility of the reduction, and the singular procedure resorted to with a success that seems to warrant its employment again under similar circumstances.

§ 2. Of Multiple and Adherent Fœtuses.

The signs by which we are able to detect the presence of twins can in no wise aid in ascertaining the adherence, or the more or less intimate fusion, of two living beings into each other. The diagnosis is likewise very difficult at the period of labor; for, even after the twin pregnancy has been recognized, it is only by negative evidence that we can suspect the adhesion of the two children.

If two bags of waters are detected by the finger, if it is necessary to rupture the membranes twice, if the waters are discharged at two separate and distinct periods, the presence of independent twins in the womb may be regarded as certain; for there are never two envelopes for a double monster, and two perfect twins are very seldom inclosed in the same amniotic pouch. Again, if two feet or even a single one descend with the head, more particularly if the feet yield to the tractions made on them, and appear at the vulva without the head having a tendency to reascend, we may affirm there are two infants; because a monster is never composed of two individuals so united that the head of the one is alongside of the feet of the other; but if several limbs present simultaneously, we can only ascertain whether the children to which they respectively belong are joined together or are independent, by carrying the hand up into the womb. (Dugès, *Mém. de l'Académie.*)

Is it proper to interfere in all cases, whether the monstrosity be recognized or not, or should the delivery be abandoned to nature for a certain length of time? The recorded instances, which prove that a spontaneous delivery may take place, are too numerous at the present day to warrant an active intervention until after a sufficient length of time has been accorded to the uterine contractions to effect the expulsion. The mechanism by which the delivery is finally accomplished will also vary according to the particular kind of monstrosity.

When the two fœtuses are united by the breech or head, their expulsion takes place without any marked difficulty, and they generally escape one after the other, more particularly when they happen to be joined at the breech. But if connected at the occiput, the point of union is seldom flexible enough to permit the two heads to descend simultaneously; and if the patient is at her full term, the intervention of art will become necessary.

Where there are two heads for a single trunk, the mechanism varies according to whether the monstrosity presents by the vertex or by the breech; but the delivery is still possible, if the twins are slightly adherent and so movable as not to be invariably parallel, for then the two heads may engage successively and not simultaneously. In the vertex presentations, the anterior head, which is the most inferior on account of the obliquity of the body of the child situated in the line of the axis of the superior strait, engages first; and then the other, which had been primitively arrested by the sacro-vertebral angle, follows it. On the contrary, where the infant is delivered by the breech, the posterior head will engage the first, in consequence of the inclination impressed on the trunk by the axis of the pelvic canal; and the anterior one, which was hitherto delayed by the symphysis pubis, will engage immediately afterward.

When each head has its own body, but the two trunks are united by their lateral, anterior, or posterior faces, whether throughout their whole extent, or only in a partial degree, a spontaneous delivery is more difficult than in the former cases; but when it does occur, it takes place just in the same way. If there is only one head for two bodies, the latter are expelled simultaneously, and the only difficulties which can then present, depend on the unusual size of the head, which is sometimes very large.

The process does not always advance as favorably as we have just stated, since it is not at all unusual for one of the heads (where the double condition involves the whole body, or is limited to the head) to be arrested above either the sacro-vertebral angle or the symphysis pubis, and thus delay the subsequent descent of the one that is already engaged, or on the point of engaging.

What has just been stated concerning the mechanism by which the expulsion of the bicephalous fœtuses is effected, would naturally lead us to suppose, that, whenever one of the heads shall have been arrested above the superior strait, the pelvic version should be resorted to, if the monstrosity presents by its cephalic extremity or trunk; and if the breech descends first, to draw on the lower extremities. But, in either case, when the greater portion of the body is delivered, it would be necessary to carry it up in front of the symphysis pubis, so as to favor the engagement of the posterior head, prior to the anterior one. Again, if the head that presents first shall have been engaged too long in the pelvic excavation to admit of being pressed back, and of the feet being brought down, it would be proper to make an application of the forceps, if the fœtus were still living; but, under such circumstances, this latter measure will often prove ineffectual, for the tractions made by the instrument will not overcome the resistance offered by the second head. We have, therefore, in this case only to choose between a bloody operation on the mother, and a division of the child's neck, which would permit the head that offered first to be removed, and thus render the pelvic version practicable. And here, notwithstanding the high authorities to the contrary, I do not hesitate to advocate the mutilation of the fœtus; for, in cases of this nature, I would have no scruple in sacrificing the infant's life to the safety of the mother.

CHAPTER XVI.

ARTIFICIAL DELIVERY OF THE PLACENTA.

Natural delivery of the placenta was described on page 381. We have now to study the difficulties and accidents which may attend the process, and for this purpose shall devote to them two different articles.

ARTICLE I.

DIFFICULT DELIVERY OF THE PLACENTA.

The difficulties that may require an artificial delivery of the after-birth are caused either by inertia of the womb, excessive volume of the placenta, weakness of the umbilical cord, irregular contraction of the uterus, or by intimate adhesions of the placenta itself.

Whenever repeated attempts to effect its delivery, made according to the rules stated (p. 381), prove ineffectual, the attendant ought to search for the cause of the delay, both by abdominal palpations and by a vaginal exploration. One of two things will then occur: either the placenta will be found lying over the internal orifice, or it will be so high up that the finger cannot reach it. Supposing the previous tractions had been made in the proper direction, an obstacle to the delivery in the former case could only depend on the unusual size of the after-birth, on the fragility of the umbilical cord, or on a contraction of the uterine orifice; in the latter, the placenta must evidently be retained at the fundus, either by abnormal adhesions, or by the irregular contraction of some part of the uterine walls. This first diagnosis being once established, the operator only has to decide upon which of those circumstances the delay is dependent.

§ 1. Inertia of the Womb.

We have hitherto stated that the contracted uterus forms a large, hard, and resistant tumor in the sub-umbilical region after the child is born. Now, it may happen, either from the general debility of the patient, or from the feebleness or atony of the womb itself, that its organic contractility is not aroused, and the organ still remains after the birth of the child in a state of partial or complete inertia.

This inertia of the womb (which will claim our special attention when treating of the hemorrhage that so frequently accompanies it after the delivery) may be simple or complicated with flooding; but we have only to speak of the first variety at the present time.

This condition is indicated by the large, soft, and insensible tumor, which is detected by applying the hand upon the abdomen.

If the inertia of the womb is not attended with flooding, it is probable that the placenta still remains undetached; and therefore no imprudent tractions should be made on the cord, lest a separation occur before the inertia is remedied. This would inevitably produce a frightful hemorrhage, which might cost the patient her life in a few minutes; or, should the placental adhesions resist the tractive efforts, the womb would be drawn down along with the after-birth, thus producing a partial or complete inversion of the organ. It is, therefore, a truly fortunate circumstance when the inertia is manifested before the separation of the after-birth is commenced. A further source of hemorrhage is found in the umbilical vessels; but this accident is exceedingly rare, and besides it can easily be remedied by applying a ligature on the cord.

The best course to be pursued in cases of simple inertia, is to wait until the uterus regains its powers; the return of the contractions might be accelerated, however, by moderate frictions over the lower part of the belly, or by titillating the os uteri with one or two fingers in the vagina, and by the application of cold compresses over the hypogastric region, and on the upper part of the thighs. In cases of partial inertia, some English practitioners, Dr. Murphy in particular (*London Med. Gaz.*), have recommended a tight bandage around the abdomen; or, preferably, a resort to immediate pressure over the uterus, by applying both hands on the sides of the organ. M. Guillemot asserts that he has often succeeded in arousing and keeping up the contractions by plunging the end of the cord in a glass of cold water; but we can scarcely comprehend how this singular result can occur. The patient's strength is to be kept up at the same time by some broth, or, possibly, by a little good wine, or brandy and water.

§ 2. EXCESSIVE VOLUME OF THE PLACENTA.

This may be either real, or due to the collection of large coagula in the pouch of the membranes, created by the inversion of the placenta in falling upon the os uteri, after its detachment. This source of difficulty is easily recognized by observing the unusual volume of the uterus above the pubis, and by detecting the detached mass at the os uteri by the finger.

In most instances, the natural contractions of the womb, assisted by a moderate traction upon the cord, are all-sufficient for the delivery of the after-birth; though it is occasionally necessary to pass the hand into the vagina and to carry one or two fingers up into the uterine cavity for the purpose of hooking it down. When the increased size is owing to the accumulation of coagula in the pouch, the membranes, if within reach of the finger, or the placenta itself, should be perforated so as to afford an outlet to the fluid part of the blood, whereby the total mass is diminished, and its subsequent expulsion or extraction facilitated.

The simplest method is, to seize the placenta with the entire hand, and, after squeezing it, in order to expel the clots, withdraw it at once.

§ 3. WEAKNESS OF THE CORD.

This weakness, whether owing to deficient development of the cord itself, as happens in cases of premature labor, or to the particular mode of distribution of the umbilical vessels, so well described by Benckiser in his inaugural thesis (see *Umbilical Cord*), may facilitate its rupture; and hence the operator ought to be very careful in pulling on this part. Again, a rupture of the cord during the delivery may be dependent on its oblique attachment to the placenta. Therefore, as a general rule, whenever the hand feels it giving way during the traction (for it produces a peculiar yielding sensation), the attempt should be discontinued; and, unless there are some special reasons to the contrary, the further delivery must be left to the powers of nature, or else the placenta itself should be laid hold of, if it be deemed proper to extract it immediately.

In conclusion, if, notwithstanding all proper precautions, the cord does become ruptured, the accoucheur has only to introduce the hand into the vagina, and pass up two or three fingers into the uterine cavity, so as to seize and extract the placenta.

It is then sometimes difficult to distinguish the placenta from the wall of the uterus itself, thus exposing the operator to make dangerous tractions upon the latter. The following signs may enable us to avoid committing an error of this kind: 1. The fingers applied to the fœtal surface of the placenta can distinguish the projections formed by the vessels which are distributed upon it. 2. Pressure upon the placenta would hardly be perceived by the patient, whilst it would be painful if applied to the wall of the uterus. 3. Lastly, the other hand applied upon the hypogastric region, is sensible of a greater thickness of parts intervening between it and the hand within the organ than could be due simply to the united thickness of the walls of the abdomen and of the uterus.

§ 4. IRREGULAR OR SPASMODIC CONTRACTION OF THE UTERUS.

The causes of uterine spasm are very obscure; though, according to Stoltz, the predisposition exists in the organ itself. If any exterior causes can contribute to its production, they certainly must be those which have a special action on the womb: such as, improper frictions or manipulations, pulling on the cord, and the abuse of stimulating remedies, the ergot particularly. Again, the irregular contractions of the uterus are more frequently remarked after a twin labor than others. The modern authors, who have made this a subject of special study, do not fully agree with each other, in regard to the sequelæ of these irregular contractions. The different forms exhibited by the uterus in such cases have been reduced, by M. Guillemot, to two principal varieties: the one depending on the conformation of the womb, and the other developed as a consequence of the presence of some foreign body in the viscus. The former is designated by him as the *hour-glass*, or spasmodic contraction of the neck at its internal orifice; the latter by the term *encystment*, or the irregular contraction of the body of the womb.

We shall follow the example of M. Stoltz, by admitting four distinct varieties of uterine spasm, namely: 1st, a spasmodic contraction of the external orifice of the neck; 2d, that of its internal orifice; 3d, that of one or more portions of the body of the uterus; and, 4th, a spasmodic contraction of the whole womb.

1. *Spasmodic Contraction of the External Orifice.*—A person who has had many opportunities of observing the softness and flaccidity of the cervix uteri at its lower part after the child is born, can scarcely comprehend the possibility of spasm at its outer orifice; and hence many authors have altogether denied its existence. Besides, it must be evident that, even if such a condition were to occur, it would constitute but a momentary obstacle to the delivery of the after-birth; and therefore we would only have to wait until the spasm of the orifice had yielded to the force of the contractions. Or, if any accident should occur requiring prompt delivery, the resistance might be surmounted without difficulty.

2. *Spasmodic Contraction of the Internal Orifice.*—This is what M. Guillemot understands by the term *hour-glass* contraction of the womb; and we quote a considerable part of his excellent description of it. When the hand is introduced, the cervix is found projecting into the vagina, and so disfigured that it resembles a section of the large intestines; but about five or six inches above this, the finger is arrested by a kind of stricture, which is the wrinkled and contracted internal orifice. According to Madame Boivin, the uterine neck sometimes measures five or six inches in length and four to five in diameter, in this state of flaccidity; the cavity of the womb containing the placenta is found above the retracted part. In some instances the uterine walls are firmly contracted around this mass, whilst at others they are in a state of partial or complete inertia. The cavity of the womb is thus divided into two portions. When the upper one is contracted on the placenta, as most generally happens, its volume does not exceed the moiety of the whole organ; and hence the retraction, although seated at the internal orifice, seems to exist very near the middle of the uterus; which circumstance has induced many practitioners to suppose that they had encountered an irregular contraction of the body of the womb.

In most cases the after-birth is retained entirely within the superior cavity; but this is not always the case, for, in some instances, the vascular mass has been found strangulated, to a certain extent, by the stricture of the neck, one part being retained in the upper portion and one in the lower. Whence it may happen: 1st, that a very small portion of the placenta projects into the vagina; or, 2d, that it is strangulated near its central part; or, 3d, that more than one-half of the placenta hangs down below the strictured orifice; which different circumstances, as we shall have occasion to show, modify the treatment.

The hour-glass contraction is recognizable by the shape of the uterus, and by the resistance presented at the internal orifice, both to the placenta and to the accoucheur's finger. The organ is found hard and contracted, when felt through the abdominal walls, and all tractions on the cord prove ineffectual; besides, the operator, by resorting to the touch, will find the placenta above the internal orifice, which is contracted, whilst the walls of the neck below are soft, flabby, and pendent in the vagina; and, lastly, there is no discharge of coagula, and sometimes even no blood of any consequence escapes.

When the stricture is not accompanied by any pressing symptoms, we should wait, for the spasm generally gives way in the course of a few hours; the uterus then regains its normal form, and the after-birth is expelled. Should it persist longer than four or five hours, the opiate preparations might first be resorted to, followed by venesection, if indicated by the general phenomena of plethora; bathing might, likewise, prove very useful. But the difficulty of watching the state of the uterus during its administration must restrict its use greatly. But if, notwithstanding the employment of all these measures, the spasm does not yield, or if it is complicated by an alarming hemorrhage, we must forthwith attempt the dilatation of the strictured part. This is effected by first introducing one finger, then two, and then three, with a view of enlarging the orifice by degrees until it will admit the whole hand. The advice of M. Stoltz, to smear the fingers with belladonna ointment, might prove serviceable. Should a portion of the placenta be engaged in the retracted part, our course would evidently vary under the different circumstances alluded to above. For instance, if a very small portion only of the after-birth is engaged, the operator ought to push it up, and then penetrate into the uterine cavity, in the way just described; but if strangulated near its central part, the fingers are to be slipped up between it and the neck, and then the part that is still above the stricture is to be gradually drawn down. Again, if most of the placental mass is already clear, we must get hold of this free portion, and by compressing it forcibly in the hand, endeavor to reduce the size of the strangulated part, and thereby effect the delivery of the whole.

3. *Irregular Contractions of the Body of the Womb.*—The womb in contracting becomes accurately applied on the body contained within its cavity; and, of course, where the placenta still remains undelivered, the womb retracts upon it. As the contractions operate at all parts, the walls of this organ, being opposed to the circumference of the placenta, and, consequently, meeting with little or no resistance, gradually approach each other, and shut it up within their cavity; this constitutes the inclusion of the placenta; and it may assume two very distinct forms, to which different names have been applied, *i. e.*, the encystment and the encasement.

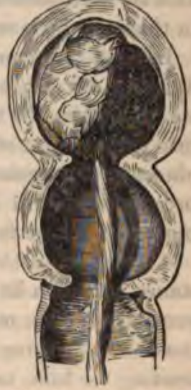
Encystment is that variety in which the placenta is so surrounded on all sides, excepting at the opening of the cell for the entrance of the umbilical cord, that it is absolutely imprisoned. Encasement is that in which the uterine walls in contracting upon the circumference of the placenta, constitute around its margin a kind of collar, or frame, which encases it, just as the turgid conjunctiva surrounds the cornea in chemosis.

These two species may either be partial or complete: the encystment is said to be complete, when the placenta is altogether shut up in the cell or cyst formed by the retracted uterine walls; and incomplete, where some portion of it breaks out of the door of the cell. In the latter case, the cell is perfect, being lined throughout by the centre of the placenta, whilst the other parts of the latter, that have escaped from the cyst, are attached to the neighboring portions of the uterine walls.

The encasement is complete, when the collar formed by the retracted uterine fibres surrounds or encases the whole circumference of the placenta; and incomplete, where it only exists on a part of the periphery of this vascular mass.

In some instances, the womb is not moulded on the circumference alone of the placenta. "For if," says M. Velpeau, "the after-birth were solid and even, like the head, the womb in contracting would necessarily retain the form of a pouch; but the cotyledons, in the process of the detachment, may separate from each other, and the placenta would then offer more resistance in some parts than in others; so that the uterus soon divides into several compartments, or divisions, more or less distinct from each other, and each of which embraces some portion of the after-birth." In these cases, the hand, in effecting the artificial delivery, would necessarily have to penetrate through four, five, or occasionally even six circular strictures, after having dilated them.

FIG. 117.



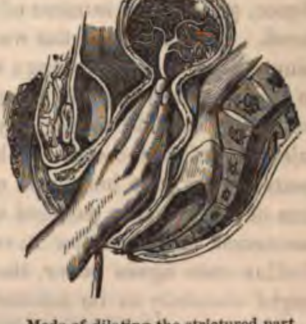
The hour-glass contraction of the womb.

The encystment may be complicated by a retraction of the internal orifice (see Fig. 117); but, in most of the recorded cases of this kind, the resistance has easily been surmounted.

It may take place at any portion of the womb whatever, though more rarely at the fundus than elsewhere; which is probably owing to the circumstance of the fibres in this region being more active, so that the detachment of the placenta, when it is inserted at the fundus, is accomplished much sooner.

The encystment may be recognized without much difficulty; for, by palpating the lower part of the belly, two tumors are detected just above the pubis, formed by the body of the uterus; the larger of which contains the after-birth, and the other, placed below or towards one side, and joined to the first by a kind of neck, constitutes the remainder of the uterine globe. And, by following the cord with the index finger up into the cavity, we find its lower portion but little retracted; though further up the finger detects a small rounded opening, the orifice of the cell through which the cord passes; and beyond it are the irregular walls of the cyst, inclosing the placenta.

FIG. 118.



Mode of dilating the strictured part.

Here, also, the accoucheur ought to wait, if the encystment is not complicated by any accident; endeavoring, however, in the meanwhile, to favor the return of the womb to its normal form, by a resort to the measures before advised. When any danger threatens the mother's life, he ought to dilate the orifice of the cyst with the ends of the fingers, and thus penetrate carefully into its cavity. (See Fig. 118.)

While these attempts are being made internally, the other hand, placed on the hypogastrium, must grasp the fundus, and keep it in position. Douglass, who devoted particular attention to this subject, avers that the placenta is generally still adherent; but Ramsbotham, Dewees, and several others assert, on the contrary, that it is usually detached. In the former case, the operator would have to attempt its separation; always taking the precautions mentioned below. It is to be delivered by taking hold of one border, with a view of making it clear the mouth of the cyst more readily; and if it is but partially encysted, the index finger is entered and passed around that portion of the placenta held by the periphery of the opening; in this way both relieving the stricture and disengaging the encysted part.

Instead of attempting to dilate the mouth of the cell, which is often very difficult, M. Dubroca, of Bordeaux, has suggested a new plan, which is styled by him the *method of erosion;* it consists of the introduction of a finger into the opening of the cell, and then, with it, tearing up and reducing the placenta to fragments, which are afterwards expelled. He says this mode proved successful in some instances in which he could not succeed in passing two or three fingers into the cyst in the usual way.

4. *Spasmodic Contraction of the whole Organ.*—M. Stoltz relates an instance in which he was called to a woman who had been delivered an hour previously, by a midwife, after the administration of two scruples of ergot; the midwife, being unable to extract the after-birth, thought proper, before sending for him, to exhibit a sixth dose of eight grains. On his arrival, he found the woman's general condition favorable; the fundus of the uterus extended nearly up to the umbilicus, and the entire organ was developed as much as at the fifth month; but its walls were contracted to such a degree that it was quite firm and hard. Following up the cord, the index finger reached the external orifice, which was greatly retracted, and scarcely permitted the introduction of the first phalanx; every part of the womb within reach was firm and contracted, just like the fundus and body. Of course, the delivery of the after-birth was out of the question; besides, no complication indicated its necessity. It was then about half-past two o'clock in the morning; a draught, consisting of half a drachm of Hoffmann's anodyne liquor, and twenty minims of the common tincture of opium, was administered. The fundus of the womb did not seem to be any less contracted at nine o'clock in the morning; but, by operating with care, M. Stoltz succeeded in dilating the orifice, and in passing three fingers up to the root of the cord; but being unable to get any further, he withdrew his hand, and directed injections of a decoction of belladonna and hyoscyamus. These were repeated every half hour, and at the fifth injection the midwife found a portion of the placenta engaged in the vagina; she forthwith drew upon it, and succeeded in extracting it, twelve hours after the child's birth. Should a similar case again occur, the prudent course of the Strasbourg professor ought certainly to be followed. In addition to which, venesection, tepid bathing, &c., might be resorted to, if indicated by a plethoric condition of the patient.

[Although spasmodic contraction of the entire uterus, the external orifice included, is rare, tetanic spasm of the internal orifice and of the body, the external orifice remaining very dilatable, is not an uncommon event. Whatever hinders the expulsion of the placenta, all obstructions causing it to be retained too long in the uterus, predispose to spasmodic contraction of the organ. What, however, occasions it oftener than anything else is the untimely administration of ergot. In all cases of the kind which I have witnessed, it appeared to me that the fundus of the womb was very high up, as though the body of the organ had become elongated by a moulding process upon the strongly compressed placenta within it. Therefore, when one is so fortunate as to succeed in dilating the internal orifice with one or two fingers, it is necessary to pass them very far up in order to reach the highest part of the placenta, which they are then to be hooked around in order to its withdrawal. Such is the process to which we give the preference.]

On the whole, then, it would appear that the irregular contraction is generally partial, though it may be seated at any or every part of the organ; and further, that all these cases are to be treated in the same way. That is: 1st, to wait patiently; 2d, in the course of a few hours to resort to frictions over the fundus, to titillations of the os uteri, and opiate preparations by inunctions or injections, belladonna to the cervix, either in the form of extract or decoction, venesection, and general or local bathing. Burns recommends the sudden application of cold compresses. In most instances, the administration of antispasmodics by the mouth, such as sulphuric ether, hyoscyamus, belladonna, or opium, is of unquestionable service; and 3d, when there is any complication that endangers the patient, the forced, though slow, gradual, and careful introduction of the hand, and extraction of the placenta.

§ 5. ABNORMAL ADHESIONS.

In the present state of our science, it is very difficult to point out a satisfactory cause for these abnormal adhesions of the placenta. According to most authors, they are owing to a fibrous transformation of the cellular filaments which hold the placenta and uterus together, whereby they acquire a degree of solidity sufficient to withstand the uterine forces. These adhesions[1] have also been referred to the degenerations of the placental tissue itself, as well as to various osseous and calcareous concretions. In a case detailed by M. Stoltz, the bond of union was evidently formed by a layer of coagulated blood, which had served to arrest a hemorrhage at the fourth month of gestation. M. Dubois appears to accept this view (Oral Lessons), and attributes these adhesions to patches of a whitish matter of a greater or less degree of hardness, evidently of a fibrinous nature, and increasing in density with the age of the sanguineous effusion of which they are the only remains. According to M. Gendrin, the adhesion is made by the circle which the reflected decidua forms around the placenta. Sometimes it is only produced at a few points of the uterine surface of the placenta, by the conversion of some part of the organ into a non-vascular, cellulo-fibrous tissue, by the accidental atrophy of one or more of the placental cotyledons; which atrophy not unfrequently occurs. The generally received opinion is, that these abnormal adhesions result in consequence of an inflammation of the placenta, or of the uterine wall during gestation, which is terminated by the exudation of plastic and coagulable lymph between the contiguous surfaces. Our own belief is, that these adhesions are caused by the fibro-fatty degeneration and atrophy of the villi of the chorion and of the cotyledons which they form. (See *Fibrous Lesions of the Placenta.—Diseases of the Placenta.*) But whatever may be the cause that produces such adhesions, there are certain persons who appear to have an unfortunate predisposition to them, since they suffer from this accident at every confinement.

---

[1] Dr. Dubois furnishes an instance of an abnormal adhesion of the placenta, in which the latter was covered by an osseous or cretaceous substance; but Gooch, who reports the case, further remarks, that he found the placenta partly ossified three times in the same woman, and that he never had any difficulty in delivering the after-birth.

Monro and Merriman also mention several cases where they noticed patches of ossification on the uterine surface of the placenta; in which the latter, they go on to say, adhered, perhaps, a little more than usual.

The adhesion may be more or less extensive; sometimes existing over the whole placental surface, but at others restricted to certain parts; for instance, it may exist at the margin or circumference of the after-birth, the centre being detached;[1] or it may be restricted to one or more points of its surface. It likewise offers various degrees of resistance; occasionally being feeble enough to yield readily, even to moderate tractions; though it is sometimes so strong that either the placental or the uterine tissue yields rather than the bond of union. In some instances, the adhesions are so firm that they cannot be broken up without the greatest difficulty, even after death. For example, Morgagni found a portion of the detached placenta hanging in the uterine orifice of a woman, who died thirteen days after her confinement; but the other part of it was so adherent that he could scarcely separate it with a scalpel. The adherent portion was indurated, and some traces of inflammation were found on the corresponding part of the womb.

Whenever a considerable period of time has elapsed after the labor, without the delivery of the after-birth being effected, and yet the globular form of the uterus,[2] its hardness and manifest contraction, clearly show that it is striving to detach and to expel the secundines, and where the finger, passed through the cervix uteri, does not detect the placenta, we have every reason to suppose that there is an unnatural adhesion of this mass. The following signs will then confirm our suspicions: after drawing on the placenta by means of the cord, the latter will be found to mount up as soon as it is relaxed; during the contraction, the uterine globe becomes harder and diminishes in volume, but after the pain is over, it returns to its former condition much sooner and more perfectly than in other cases; and, lastly, the existence of this complication is rendered unequivocal by carrying the hand up into the uterus.

---

[1] It frequently happens, says Leroux (*Traité des Pertes de Sang*, page 306), that the placenta is thus detached at the middle, but remains adherent by its margins. The same thing was observed by Albinus, in a woman whose womb he has sketched. "The female," he says, "whose uterus is represented in several of the plates, had a detached placenta, and there was a considerable quantity of clotted blood between it and the organ; it was adherent, however, around the whole border, whereby flooding was prevented." (*Louis' Translation of Van Swieten*, t. vii. p. 145, and *Heister*, t. ii. chap. clv. p. 459.)

[2] I think, says John Ramsbotham, that I have observed a slight alteration in the shape of the uterus. It presents a less regularly spherical form, and its fundus also exhibits a certain degree of conicity. (*Obs. on Midwifery.*)

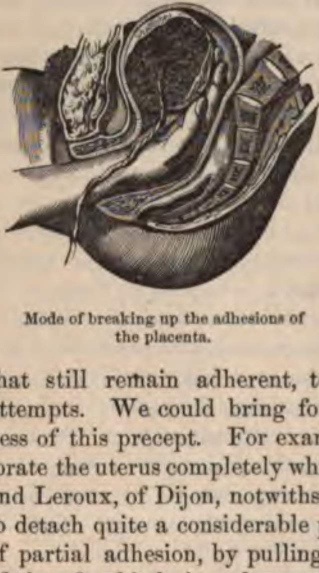
The abnormal adhesions of the placenta may exist alone, or they may be complicated with some accident; its partial adherence is nearly always accompanied by a more or less profuse hemorrhage. In cases of simple adhesion, the accoucheur should always wait, for a delay of a few hours is often sufficient to effect the separation; then, after waiting for a couple of hours, the uterus is stimulated to contraction by the various means before indicated; but if these prove insufficient, an injection of cold water is to be thrown into the umbilical vein. After having cut the end of the cord, and squeezed the vein so as to free it entirely of any blood it may contain, the cold liquid is injected into this vessel with a sufficient degree of force to diffuse it throughout the placental mass. This ought to be repeated, taking care to retain the fluid in the after-birth for several minutes by securing the cord. This injection evidently has a twofold operation, affecting both the placenta and the womb; that is, it distends the former by the introduction of a new liquid into its vessels, thereby augmenting its size and weight; and the impression of cold on the internal surface of the latter brings on its contraction. This measure, therefore, ought not to be overlooked.

Where it fails, tractions on the umbilical cord are to be resorted to; though always, as advised by Levret, perpendicularly to the surface of the placenta. If two sheets of moistened paper are stuck together, continues this author, for the purpose of illustrating the importance of his precept, and you endeavor to separate them by sliding one over the other, that is to say, by drawing them parallel to their planes, you tear rather than detach them; whilst, by pulling perpendicularly to those planes, you will separate them without the least effort, as also without any laceration. In order to obtain a similar result in practice, the umbilical cord is carried towards the side not occupied by the placenta, by the intervention of two fingers passed into the vagina beyond the uterine orifice. But it is impossible to carry out this rule, as Velpeau and Guillemot justly remark, because both the fœtal and the uterine surfaces of the after-birth are in contact with the walls of the organ; besides, the fingers can only sustain the cord below the cervix, and hence, as a natural consequence, the cord will always be parallel with, not perpendicular to, the long axis of the womb, in whatever manner it be held. The same effect is produced equally well, in their opinion, by drawing on it without this artificial pulley. Though whichever plan be resorted to, the operator must never exert force enough in making the tractive efforts to rupture the cord, and he should desist as soon as he finds it yielding.

But, supposing all the local and general irritants, the injections into the umbilical vein, and the tractions upon the cord just recommended, have proved ineffectual, what is to be done? When the adhesions are complicated by any hemorrhagic or convulsive affection, all accoucheurs are harmonious on one point, namely, to persist in the attempts to effect the extraction. But the same unanimity does not exist with regard to cases of simple adhesion; for some, dreading the disastrous phenomena that may result from the retention and subsequent putrefaction of the placenta, and the absorption of putrid matters, are in favor of terminating the delivery at every hazard; while others, on the contrary, fearing still more the consequences of the manipulations which are necessary for effecting the detachment of the placenta, advise us to abandon the whole to nature; at the same time recommending the ulterior symptoms to be met and combated as they arise by the appropriate measures.

Our own opinion is, that the course of Levret, of Baudelocque, of Desormeaux, and M. P. Dubois, is the best adapted to cases of this kind; that is, after having employed the various means we have spoken of, to introduce the hand into the uterine cavity, following the cord, which is then the best guide up to the placenta. Should this have been torn away, the latter could be recognized by the vascular ramifications which characterize its fœtal surface, by its elevation above the inner face of the uterus, by its consistence, and by the dull sensation felt by the patient when the fingers bear upon it. The point of attachment being discovered, the next step is to ascertain whether the adhesion is complete or partial; in the latter case, it is recommended to insinuate the open hand between the external surface of the placenta and the uterine wall, and then slit up the adhesion with the finger, just as you would cut the leaves of a book with a paper-knife; (Fig. 119.) It is certain, however, that it is a piece of advice which it will be found impossible to follow. M. P. Dubois thinks it is better to seize the detached part with the whole hand, and pull upon it, with a view of completing the separation of the rest; but if this proves unsuccessful, he next tears and brings away all the lose portion. These abnormal adhesions are most readily overcome by a short scratching motion with the ends of the fingers. All attempts of this kind ought, however, to be made with great caution: leaving the ulterior expulsion of those parts that still remain adherent, to nature, without resorting to any further attempts. We could bring forward numerous cases in proof of the soundness of this precept. For example, we have known a rash operator to perforate the uterus completely whilst striving to separate an adherent placenta; and Leroux, of Dijon, notwithstanding all his dexterity, had the misfortune to detach quite a considerable part of the internal muscular plane, in a case of partial adhesion, by pulling too strongly on the detached upper portion of the after-birth, in order to separate its still adherent lower part. Death soon followed in the case we allude to; and the surgeon of Dijon had a profuse hemorrhage to encounter in his, but he fortunately succeeded in arresting it by the application of the tampon.

FIG. 119.



Mode of breaking up the adhesions of the placenta.

When the placenta becomes separated at its central part, the margins being still adherent, a cavity is usually created at that point, in which the blood accumulates. Under such circumstances, the centre of the mass may be perforated, and the fingers be passed up through the opening, to complete the detachment; at least, such was the course adopted by Heister and Leroux. Furthermore, where the placenta is adherent throughout, the accoucheur operates on its external face, by slipping up the hand behind the membranes; and when it reaches the circumference of the after-birth, he first endeavors to detach one part, and, where successful, he pursues the same course as if it had originally been a case of partial adherence.

Finally, let us add, that it is not proper to persist too long, when a part, or even the whole, of the placenta holds out against the properly conducted manipulations just advised; for its expulsion will probably take place sooner or later, either all at once, or in fragments.

[The membranes, as well as the placenta, sometimes become abnormally adherent at some points of their surface, and the difficulty thus occasioned may be recognized in the following manner. At first, all the phenomena of the delivery of the placenta take place as usual, and the detached placenta is forced down upon the internal orifice or into the upper part of the vagina; but from thence it is with difficulty brought to the vulva. It is found to resist the tractive effort, to be held back, as it were; and if a finger be passed behind the symphysis pubis, the membranes are found to be in a state of tension. Any sudden application of force would inevitably extract the placenta, but at the same time would leave a portion of the membranes in the cavity of the uterus. In order to avoid so unfortunate a result, it is important to temporize, to draw very gently but continuously upon the membranes, and also rotate the placenta so as to twist them and give them greater power of resistance. Finally, if necessary, the hand may be passed into the vagina, and by following up the membranes the point of adherence may be reached and detachment accomplished. Although retention of a shred of membrane is a less serious occurrence than retention of a cotyledon of the placenta, it may, nevertheless, give rise to secondary hemorrhage. (See *Secondary Hemorrhage.*)]

§ 6. OF PARTIAL AND COMPLETE RETENTION OF THE PLACENTA.

By conforming to the rules just mentioned, we shall rarely fail in extracting the placenta completely; but we have seen that there are nevertheless some cases in which a larger or smaller portion of the after-birth is necessarily left behind, and its expulsion confided to the resources of the economy. Whether this abandonment be obligatory, or the result of ill-directed tractions on the cord, or of improper attempts to effect the separation of the adherent placenta, it may lead to various consequences, some of which are very serious. It is, therefore, very important to determine the fact, which may almost always be done by a careful examination of the placenta. The only difficulty which could arise, would be occasioned by its separation into fragments in consequence of its very close adhesion.

A. *Hemorrhage* is almost always the immediate consequence of the retention of any considerable part of the placenta, and its amount is generally proportionate to the size of the abandoned portion. Sometimes, however, no flooding occurs; either because the uterus contracted properly after the separation of the placenta, or because the fragments left behind remain attached to the walls of the organ. In the former case, the contraction of the womb diminishes the discharge after the lapse of some hours; and during the few succeeding days, excepting the violent colicky pains occasioned by the efforts of the uterus to expel the foreign body, the patient suffers little more than the discomforts attendant upon a moderate hemorrhage.

It is not long, however, before these frequent after-pains seem to give rise to an unusual tenderness of the uterine tumor; and, finally, even slight pressure becomes painful. The lochia, which hitherto were composed entirely of blood, present a different character. They are mixed with a very fœtid, sanious fluid, and become very irritating to the genital parts. If the temperature should chance to be high, and especially if the most scrupulous regard is not paid to cleanliness, they diffuse such a disgusting odor as to render the chamber untenable; and, as M. Jacquemier observes, the assistants are liable to suffer severely from it.

This change in the lochia is due to the putrefaction of some portions of the placenta. As parts of the adherent mass become gradually detached, they fall into the cavity of the uterus, where they are liable to remain for some time. The contact of air which readily reaches the uterus soon gives rise to putrefaction, and the decomposed fragments communicate to the lochia the odor which characterizes them.

B. *Putrid Absorption of the Placenta.*—These local phenomena rarely appear without being accompanied by a sensible alteration of the general health of the patient. After a longer or shorter time, a violent chill comes on, attended with extreme restlessness and anxiety, the pulse becomes rapid, and the skin dry and burning; the face is alternately pale and flushed, though mostly pale; the respiration is anxious and frequent; the tongue, which is always dry, is sometimes white and sometimes red; the patient complains of pain in the head, attended occasionally with throbbing, and soon delirium, at first intermittent and finally constant, is added to the other symptoms. The latter become more and more serious; the abdomen is distended and very tender; inclinations to vomit, sometimes even profuse vomiting, and, occasionally, frequent and involuntary alvine discharges, show that the alimentary canal shares in the general affection. Finally, the pulse becomes more and more rapid, thread-like, and undulating; the debility and restlessness are extreme, there is no cessation of delirium, and death closes this terrible scene five, ten, or fifteen days after the invasion of the first symptoms.

Peritonitis, which is in some cases indicated by the tenderness and distention of the abdomen, does not always occur, and death may result simply from the species of poisoning occasioned by the absorption of the putrefied fragments of the placenta. The symptoms presented by the patient are then simply those of the fevers commonly called adynamic and ataxic.

The result is not necessarily fatal, and especially when the disease is uncomplicated with peritonitis, the patient may escape from the danger which threatened her.

After a certain length of time, the retained portion of the placenta may become suddenly detached, and be expelled bodily; upon which, the grave symptoms to which its decomposition had given rise, cease almost immediately.

Sometimes, and under the use of frequent injections, the discharge seems to lose its fetidity and irritating qualities, and becomes more decidedly purulent. Some detached portions of the placenta are found diffused in it, and parts are also brought away by every injection; rather larger portions occasionally present at the cervix and may be extracted with the finger. Whilst the womb is thus ridding itself of the putrid matter which it contains, the general symptoms improve, or, at least, are not aggravated. The economy seems to resist the deleterious influence to which it is subjected. The patient may remain in this condition for several weeks with an almost constant febrile movement, accompanied now and then with exacerbations preceded by slight chilliness, and moderate disorder of the digestive apparatus, until, finally, when the remainder of the placenta is expelled, the fever ceases, the strength returns, and the patient is restored to health.

These serious accidents, which are always to be feared when a considerable portion of the placenta is retained within the womb, do not, however, always result from this retention. It may remain there for a long time after the delivery without seriously affecting the woman's health, and be disposed of in two different but equally strange ways. I allude to the late expulsion and absorption of the placenta.

c. *Late Expulsion of the Placenta.*—The retention of a portion of the placenta is almost always attended by a profuse hemorrhage. This, however, does not invariably occur when the entire after-birth remains in the cavity of the uterus, which rarely happens except after abortions. If, in short, the adhesions are nowhere destroyed, and the utero-placental vessels are unruptured, the reason of the absence of hemorrhage, and often even of the lochial discharge observed under these circumstances, is evident. The flooding then comes on only when the uterus at last contracts in order to expel the foreign body.

This expulsion may be accomplished at once, and the completely separated placenta be discharged whole. The hemorrhage, which had lasted four, five, or even ten days, being the time sometimes necessary for its separation, ceases immediately after, as by enchantment. This hemorrhage is always far less profuse when the detachment of the placenta takes place at a remote period from the expulsion of the child. The constant contraction of the uterus, which tends unceasingly to resume the dimensions of the unimpregnated condition, necessarily lessens the calibre of the vessels and almost obliterates them, so that their rupture at that time is an affair of little moment. On examining the placenta, it is found to have undergone no alteration, it exhales no unpleasant odor, and although it may have remained several days, weeks, or even months, in the cavity of the uterus after the expulsion of the child, it is as fresh as though the latter were just born. Its vitality had been preserved by the integrity of its vascular connections, and its prolonged retention been thus rendered innoxious.

I have just had occasion to notice a case of the kind, afforded by a young woman three months and a half gone, who miscarried twenty-four days ago. The placenta had remained since then within the cavity of the uterus, and a profuse hemorrhage having occurred in consequence of its detachment, I was obliged to extract it artificially. It was already engaged in the cervix, and its withdrawal presented no serious difficulty; the extreme weakness of the patient forbade temporizing. It had no appearance of decomposition.

[I met with two similar cases in women who were delivered at term. A portion of the placenta having been left in the womb, both of them were taken with severe hemorrhage; one on the ninth and the other on the seventeenth day. In both cases, I found the os uteri partially open, enabling me to extract a cotyledon of the placenta which presented not the slightest evidence of putrefaction.]

Unfortunately, the slowness with which the detachment of the placenta sometimes takes place, may so prolong the discharge as to give rise to another accident. When, in fact, a cotyledon is thus separated, it no longer shares in the circulation of the adhering parts, and remains suspended within the cavity of the womb. After a time, it becomes detached from the rest of the placenta, and if its size or the contraction of the orifice prevents its being discharged immediately, it decomposes, and may give rise to some of the accidents already mentioned. Generally, however, its expulsion is not long deferred, or else the practitioner deems it proper to extract it; still, it is impossible to avoid the hemorrhages, the repetition of which on the occasion of each partial separation at last weaken the patient greatly, and may even endanger her existence.

D. *The complete absorption of the placenta* is so extraordinary a phenomenon, that the first observations published were received very doubtfully. Nothing short of the great authority of such names as that of Nægèle, together with the strict detail with which the cases are related, were required to obtain for them a place in obstetric science. Yet it is so easy to be deceived in such cases, that even after the observations of Nægèle, Salomon, and Velpeau, doubts will occasionally suggest themselves. Is it not possible, indeed, that, notwithstanding the strictest surveillance, the placenta might have been expelled unconsciously? Is it not possible that the species of sanious detritus, to which its decomposition gives rise, may have formed a part of the putrescent lochia discharged in such cases? Finally, may it not have been that its prolonged retention and late expulsion were regarded as instances of absorption? In fact, that after a woman had thus retained her placenta for several months without her health having suffered materially, it may have become detached without a great deal of hemorrhage, and small and shrivelled as it was, have been discharged during strainings at stool without the patient herself being aware of it.

Most of the published cases are, doubtless, liable to one or the other of these explanations; yet it must be confessed that there are others, in which there would seem to be no doubt that the placenta had really been absorbed. After all, analogous phenomena are not wanting. In extra-uterine pregnancies, has not the fœtus often been found reduced to its bony portions, in consequence of the absorption of the other fluid or solid parts? Has not the same thing been known to take place within the uterus when a dead fœtus had been retained for a long time? The absorption of a placenta is certainly not more wonderful, especially in cases of abortion, when the placentas are small and imperfectly formed, as in most of the instances mentioned. The possibility of the occurrence cannot, therefore, as yet be absolutely denied, though it should be received with a certain degree of reserve.

Indications.—We have dwelt sufficiently upon the proper means of preventing the entire or partial retention of the placenta, and have but a word to add respecting the prudence which should govern all attempts at extraction. Although the dangerous accidents to which the woman is exposed, require that we should attempt all that is humanly possible, in order to effect its extraction, it should be remembered that too long-continued efforts, whether to introduce the hand through a contracted orifice, or to rupture the too strong adhesions, are liable to produce equally serious consequences; in fact, that post-puerperal inflammations and even ruptures of the uterus have frequently resulted from these forcible detachments; and, finally, that a placenta retained wholly or in part within the uterus, may not be expelled until after the lapse of several months, or may be absorbed without sensibly affecting the health of the mother. Although these latter occurrences are rare, they are yet sufficient to justify, and even require the relinquishment of all violent and dangerous efforts. It were impossible to furnish here an absolute rule of action, and it must be left to the intelligence and prudence of the practitioner, to determine how far he shall proceed in such cases.

The indications to be fulfilled, when a portion of the placenta has been left behind, either voluntarily, or through awkwardness, vary according to the period at which our services are demanded.

Very often a quite profuse hemorrhage is the first accident to appear, and efforts should be made to restrain it by means of cold applications to the hypogastrium, groins, and thighs, by frictions upon the body and neck of the uterus, and, with the object of obtaining a more thorough contraction of the organ, ergot should be administered. These measures will very rarely be found insufficient, provided the uterus is properly contracted; but should the accident be complicated by inertia, the measures to be indicated hereafter should be resorted to.

Care should be taken as regards relieving the violent after-pains which torment the patient, by the use of opiates, since the contractions of which they are the result, tend to separate and expel the adherent mass.

The ulterior conduct of the practitioner must be governed by circumstances. If the neck of the uterus appears to be strongly contracted, if the lochia are moderate in amount, and especially if their composition is unaltered and their color and smell unchanged, he should be satisfied with watching the patient closely without interfering with the tendencies of nature by an untimely intervention.

As soon as the lochia become sanious and fetid, he should resort to the best means of averting their dangerous influence upon the economy. Intra-vaginal and intra-uterine injections practised frequently, and continued until the returning fluid is no longer imbued with the odor of decomposition, are very useful. M. Vullyamos recommends the use of large quantities of water; he throws up an injection consisting of the warm infusion of marshmallows, by means of a large syringe, every five minutes; he prefers cold water, however, in cases of flooding. This operation is effected by the use of a long gum-elastic tube, one end of which is fixed in the uterine orifice, and the other extends beyond the vulva, or even the foot of the bed, so as to obviate the necessity of uncovering her; the returning fluid is collected in a basin placed under the patient. I think it would be m·prudent to make use of a double tube.

The patient should also be examined frequently, in order to ascertain whether any portion of the placenta presents at the cervix, and if so, it should be extracted immediately, either with the fingers, with Levret's abortion forceps, or with Prof. Pajot's curette. The injections, indeed, are not always sufficient, being incapable of bringing away moderate-sized fragments.

Extreme fetidity of the lochia might possibly authorize the use of slightly chlorinated injections.

The patient should also have the advantage of the best hygienic measures. The chamber should be thoroughly ventilated and purified by every appropriate means, and the linen changed as often as possible.

If, notwithstanding these precautions, upon which too much stress cannot be laid, symptoms of general infection should appear, complicated with peritonitis, purgatives, baths, calomel, and mercurial inunction, should be used at the outset; but the first adynamic or ataxic phenomena must be met with the tonic and stimulant treatment used in the latter stages of low fevers. Water containing wine, preparations of cinchona and acetate of ammonia, may all prove very useful.

ARTICLE II.

OF ACCIDENTS THAT MAY COMPLICATE DELIVERY OF THE AFTER-BIRTH.

The principal of these are hemorrhage, inversion and rupture of the womb, and convulsions.

§ 1. Hemorrhage.

Of all the accidents that may precede, accompany, or follow the delivery of the placenta, flooding is certainly one of the most frequent, and at the same time, most terrible in its consequences. It may occur conjointly with either of the difficulties just described in the preceding article; and when this does take place, the indications then laid down ought to be followed up more promptly. But, in addition to those circumstances, hemorrhage may likewise take place after the child is born; and this claims our special attention, since it is nearly always accompanied by complete or partial inertia of the womb. We have therefore to examine successively the causes, symptoms, diagnosis, prognosis, and treatment of this inertia, considered with particular reference to the accident in question. We shall thus complete the history of puerperal hemorrhage, which was hitherto only described in part; namely, during the first six months, in the article on *Abortion;* and during the last three months, as also pending the labor proper, in that on *Accidental Dystocia.*

A. *Causes.*—After the delivery of the child, and even during the progress of its expulsion, the uterine tissue becomes gradually retracted by the exercise of its contractility of tissue, whereby the cavity of the organ is considerably diminished; thus contracting the vessels that ramify in the substance of its walls, and reducing their calibre in a greater or less degree, thereby interrupting the circulation, and of course preventing the utero-placental vessels, which are torn by the detachment of the placenta, from becoming the source of a profuse hemorrhage. Now, under certain circumstances, this contractility of tissue is very feeble, and in others it is altogether wanting; in the former case the inertia of the womb is partial, in the latter it is complete; again, it may be total or partial, according as it affects the whole or a part of the uterine walls. All which various degrees of the affection may be developed under the influence of the same causes.

The causes of hemorrhage from inertia are either predisposing or determining; under the former head, writers have enumerated: 1st, a plethoric and sanguine habit, a precocious and usually copious menstruation; more particularly when venesection has not been resorted to in anticipation, during the latter months of pregnancy; 2d, a lymphatic temperament; for those women who have a soft and lax fibre, or possess but little muscular power, and who are nervous and irritable, are more liable than others to this affection; 3d, the occurrence of profuse flooding after former labors. We might bring forward numerous cases, all tending to prove the unfavorable influence of previous floodings; and, therefore, from the mere fact of their occurrence at one or more antecedent labors, the accoucheur ought to take suitable measures to prevent their reappearance.

Under the head of the so-called determining causes, we may classify: 1st, the exhaustion incident to a protracted and painful labor; or, in other words, all the obstacles that may oppose the natural delivery of the fœtus; 2d, a very short labor, and its rapid termination from the *stupor* of the walls, caused by the rude and hasty depletion of the organ; hence a very large pelvis, a laceration of the cervix, and a want of resistance at the perineum, all which facilitate the rapid expulsion of the child, may, from that fact alone, become sources of inertia; 3d, an excessive distention of the womb, whether dependent on a dropsy of the amnios or a twin pregnancy, may paralyze, as it were, the contractility of the uterine tissue; 4th, according to Madame Lachapelle, we must further add a dragging of the uterus, in consequence of an adhesion contracted with the omentum during gestation; whereby the perfect retraction of the organ after labor is impeded.

There can be no doubt that the various circumstances just alluded to may of themselves give rise to inertia; but, as a general rule, their influence will be of short duration and easily set aside, if it is not favored by the existence of some predisposing cause. It is to the latter, especially, as M. Guillemot observes, that we must refer the chief part in the production of those hemorrhages that occur after the child is born. In fact, where they exist conjointly in the same woman, there is every reason to fear the occurrence of that accident; whilst, if absent, the supposed determining causes usually have but little or no effect.

The influence of those causes is ordinarily manifested in the course of a few minutes after the child is born; though sometimes the inertia is secondary, as it were, not coming on for several hours, or even not until several days afterwards. The womb having contracted properly immediately after the delivery of the child or after-birth, then becomes relaxed by degrees, and ultimately gives rise to a frightful hemorrhage.

B. *Symptoms.*—Where the uterus contracts properly as soon as the labor is over, a hard, globular, rounded tumor is found in the hypogastric region, occupying nearly all the space between the umbilicus and pubis. This tumor is the seat of intermittent pains of variable intensity, and is always harder while they last. An absence of these characters indicates inertia of the organ; that is, by palpating the lower part of the abdomen, we find nothing but softness and flaccidity throughout; for the abdominal and uterine walls are so easily depressed, that they can be pushed back against the posterior ventral parietes; and, indeed, where the inertia is complete, it is even impossible to make out which are the uterine and which the abdominal walls. Again, by carrying the hand up into the womb, it readily passes through the relaxed cervix, and finds the uterine parietes everywhere flabby and wrinkled like a bit of old rag. Should the inertia be partial, the uterine structures seem to be thicker, and to have a more marked consistence; but they are still readily distended, and are far from offering their characteristic resistance.

This condition may exist without hemorrhage, if the placental adhesion still remains intact at every part of its uterine surface; but whenever a separation has occurred, flooding is clearly inevitable. Of course, the latter will be the more copious as the detachment is nearly or wholly completed at the time the inertia is manifested.

The signs by which the existence of hemorrhage is recognized are easily made out; but the discharge is sometimes so sudden and profuse, that it is not detected until the woman's life is already seriously endangered. The patient generally complains of a feeling of weight about the stomach; and, soon after, pallor of the face, dimness of vision, smallness of the pulse, weakness, syncope, and all the most alarming general symptoms are manifested. To these are added some phenomena peculiar to the uterine discharge; such as, pains in the loins, a spasmodic chill, and a dragging sensation at the epigastrium, sometimes resembling that caused by hunger; and, in the latter moments, there not unfrequently comes on a hysterical attack, or even some convulsive movements. As regards the local signs, they are variable; and hence, in this respect, the flooding has been characterized as the external and the internal. When it is external, the blood, which inundates the patient's bed, soaks through the mattress, and trickles down on the floor, cannot possibly permit any mistake as to the cause of the general phenomena just indicated. But when it accumulates in the uterine cavity, the nature of the accident may escape detection, or at least may only be recognized when it is too late to remedy it.

Every circumstance whatever that constitutes an obstacle to the ready discharge of the blood through the uterine orifice, may give rise to an internal hemorrhage; thus, a very considerable obliquity of the womb, in which the neck is carried high upwards and backwards; occlusion of the os uteri, by a part or the whole of the placental mass, or by large coagula; a badly applied tampon, or the closure of the vulva by cloths; a spasmodic contraction of the os uteri, (although, in cases of inertia, this contraction is seldom considerable enough of itself to obliterate the outlet,) must necessarily favor the formation of a clot that might easily block up the already diminished cervix. Let us add further, that the elevated position in which the pelvis is designedly placed for the purpose of arresting an external discharge, may prove a cause of internal hemorrhage.

Whenever any obstacle prevents the escape of the blood, the latter accumulates within the uterine cavity, the walls of which readily yield to distention. If the hand be then placed on the belly, the womb will be found much enlarged, occasionally even attaining the height it had during the latter months of gestation; the ball, formed by the retracted organ, is no longer felt at the usual place, its volume has increased, but its hardness has decreased; the finger in the vagina finds the uterine orifice, which is carried far backwards or is spasmodically retracted, obstructed by the placenta, or by a clot; and when passed up into the womb, it detects there a large quantity of coagulated and fluid blood. (*C. Baudelocque.*)

c. *Diagnosis.*—It is scarcely possible to mistake the nature of the accident, when the hemorrhage is external; but this is far from being the case when the blood accumulates in the uterine cavity; for, although we have enumerated the general debility, syncope, &c., and the enlargement of the abdomen, as pathognomonic signs of flooding, yet these circumstances may all be met with and still there may be no hemorrhage.

The increased size of the belly may be owing to the fact that the intestines, after having been so long compressed by the developed organs, become expanded by the gas they contain; and thus cause the abdominal walls, which are still soft and flabby, to swell up nearly to their previous size. But any errors from this source will be corrected by the resonance of the abdomen on percussion, by the vaginal examination, and by palpating the uterine globe.

"Sometimes," says Madame Lachapelle, "owing to the extensibility of the vagina, the womb is carried up by the distended bladder filled with urine, thereby singularly augmenting the size of the belly. In one instance that came under my notice, the pupils had become much alarmed by this circumstance; but I relieved their anxiety in a moment by the introduction of the catheter. For the prominence of the bladder, which is so easily recognized by an experienced person, satisfied me at once as to the nature of the case; and, besides, it was not accompanied by any of the general symptoms of flooding."

The accoucheur ought also to bear in mind that a syncope, occurring after childbirth, does not always depend on the loss of blood. It is not unfrequently observed shortly after very rapid labors; for then the womb being emptied at once, the compression to which the hypogastric vessels had been subjected during the latter months of gestation is suddenly removed; the circulation in them becomes free and unobstructed, and the rapid determination of the blood from the head and upper extremities, towards the vessels of the lower parts, often gives rise to fainting. When it occurs, the horizontal position and the application of a moderately drawn bandage around the belly, are usually sufficient to relieve the affection.

An hysterical attack, coming on immediately after the labor, might be mistaken for those nervous phenomena that so often signalize the unfavorable termination of grave hemorrhage.

But in all such cases, by resorting to the vaginal touch, and the palpation of the hypogastric region, the accoucheur will clearly ascertain the retraction of the organ; and, therefore, will not be likely to confound them with the symptoms dependent on inertia of the womb.

D. *Prognosis.*—Flooding after labor is an exceedingly dangerous accident; for a few minutes may decide the woman's fate. Of course, the discharge will be the more profuse as the inertia is more complete and the separation of the placenta more advanced. Other things being equal, an internal hemorrhage is more dangerous, as a general rule, than an external one: simply because it is more apt to escape detection.

Of the symptoms that are common to both varieties of flooding, there are some which more particularly indicate the imminency of the danger, and even a speedy death; such, for instance, as severe chills or convulsions, increasing dyspnœa, prolonged syncope, sharp and continued pains in the loins, together with vertigo and loss of vision.

"It should also be remarked that the pupil is usually dilated, that it is at times agitated by oscillatory movements, and that the dilatation is particularly evident when the syncope is most profound." (*Lachapelle.*)

E. *Treatment.*—The treatment of uterine hemorrhage from inertia is either preventive or curative.

The preventive treatment consists in breaking up the predispositions just alluded to, and in preventing the action of those causes which might determine inertia of the womb after labor. In women of a full habit, whose menstrual discharges have usually been copious, and in whom plethoric phenomena become manifested during pregnancy, it would be proper to resort to repeated blood-lettings in the course of the latter months; and, even during the labor, if the fulness of the pulse, headache, and flushing of the face, seem to require. In those of a feeble and delicate constitution, who have suffered from flooding in their former labors, measures calculated to arouse the contractility of the uterine tissue ought to be employed in the latter stages of parturition; that is, to stimulate the action of the uterus by external frictions and pressure, by the application of compresses soaked in some cold fluid acidulated with vinegar, over the belly, and more especially, by the exhibition of fifteen to thirty grains of ergot, divided into three doses, about twenty minutes or half an hour before the child is born.

Dr. Robert Lee (*London Med. Gaz.*, 1839, p. 713) recommends the following course, namely: to rupture the membranes at the commencement of the labor, in those women whose previous history would cause us to fear a profuse hemorrhage after the delivery; without waiting for the dilatation of the os uteri, or at least for the development of strong pains; he then applies a bandage around the abdomen, and gradually tightens it as the labor advances. The subsequent progress is abandoned to nature; taking care to keep the apartment cool, and forbidding the employment of stimulants of any kind. I have, he says, several times adopted this plan with success.

There are still some other prophylactic measures of great value, when there is reason to fear inertia of the womb. For instance, the best way of modifying the action of the determining causes, is to retard the termination of a rapid labor as much as possible, particularly in women of a lax fibre and lymphatic temperament; but, on the other hand, to accelerate a long and painful one by aiding the inefficient powers of nature before the patient is wholly exhausted, and before the womb falls into a state of atony. Doctor Clarke very properly advises the hand to be placed over the fundus during the expulsion of the child, with a view of affording it support, both during and after the contraction. Burns adds, that moderate pressure on the abdomen after the delivery of the placenta proves beneficial in keeping up and stimulating the action of the organ.

"But," says Madame Lachapelle, "if, notwithstanding all your exertions, and notwithstanding the most perfect rest, and the express charge to the patient not to bear down, you find the accouchement progressing with a fearful rapidity, you still have one resource left, that is, to leave the placenta in the womb until fresh pains are excited. For, in most instances, this body is not entirely detached, and it resists the flooding so long as the stupor of the womb, caused by its too sudden evacuation, persists. In the opposite case, that is, when the labor has been too long, the placenta is ordinarily separated from the uterine wall, at least in a great measure; and hence it can no longer oppose the discharge of the blood. From that time its presence will only serve to keep up the feebleness of the uterus, and by irritating its walls, exhaust it without any benefit; you should therefore proceed at once to the delivery of the after-birth, free the womb from it entirely, and take advantage of the little energy remaining to the latter to procure its proper retraction." (*Pratique des Accouchements*, t. ii.)

The English accoucheurs have taken advantage of the sympathy which appears to exist between the mammæ and the uterus, in order to overcome the tendency of the womb to inertia in certain women. Relying upon the well-known fact that putting the child to the breast often excites after-pains within the few days immediately succeeding the delivery, they recommend this to be done as soon as possible after the child is born. So great is their confidence in this measure, that, according to Marshall Hall, no practitioner would be justified in leaving a woman who is predisposed to inertia of the uterus, without directing a proceeding which is at once so simple, and so sure to be effectual. Besides the sympathetic excitement of the womb thus produced, the suction would have the additional advantage of diverting the blood from the uterus by directing it toward the breasts.[1]

I cannot too strongly insist upon the administration of from 15 to 30 grains of ergot whenever there appears to be a tendency to inertia after delivery. It is always an innocent remedy, and one which, I am sure, has prevented many a flooding.

Curative Treatment.—There is one special indication presented after the child is born, namely, that of arousing the uterine contractions, which alone can put an end to the hemorrhage, as soon as possible. The means suggested for this purpose are exceedingly various, but we shall endeavor to estimate their respective values.

---

[1] Rigby advises, that whenever there is reason to fear hemorrhage from inertia after delivery, the child be put to the breast as soon as the mother is changed and put to bed. He assures us, that in several grave cases, in which all other means had failed, the uterus contracted strongly and permanently as soon as the child had seized the nipple. In one case only did the usual effect fail to take place, and this, Rigby thinks, was due to the fact of the child of another woman having been made use of.

Of all the various measures recommended for the flooding dependent upon inertia of the womb, the easiest and most certain is a direct irritation made simultaneously over the body, and on the neck of this organ, by placing the hand on the lower front part of the abdomen so as to rub, press, and squeeze the uterine wall, whilst at the same time two fingers are passed into the vagina to irritate and titillate the os uteri. If these do not effect the object, the whole hand is to be carried up into the cavity of the organ.

Even supposing that the placenta has been expelled, the accumulation of coagula in the cavity of the uterus prevents the retraction of its muscular tissue, and the first thing to be done is to turn them out with the hand, which should be fearlessly introduced into the parts as often as may be required; then irritate and stimulate its internal surface with the fingers, the other hand keeping up the frictions on the hypogastrium in the meanwhile. The operator is sometimes obliged to compress and knead the organ, as it were, by bearing strongly on the abdominal surface, while the hand in the cavity serves as a point of support.

This measure is preferable to all others, because it can always be resorted to without alarming the patient, and is not likely to bring on an inflammation of the organ, as is the case with most of the astringent and stimulant articles advised by some writers. The injection of rectified alcohol, oil of turpentine, spirit of vitriol, &c., into the uterine cavity, recommended by Pasta to be used in such cases as a caustic, ought to be banished from practice. Even the employment of strong vinegar requires the exercise of much discretion.

Should the irritation made by the hands prove insufficient to arouse the contractility of the uterine tissue, we must resort to an application of cold, which acts both as a sedative to the circulatory system, and as an astringent on the muscular fibres. Compresses dipped in iced water are to be applied over the lower part of the abdomen, the genital organs, and the upper portion of the thighs; and a quantity of cold water might be injected into the vagina at the same time, taking care to pass the extremity of the canula into the uterine cavity. In a serious case, the example of M. Evrat might be advantageously followed; this gentleman carried a peeled lemon up into the womb, and then expressed its juice with his hand, so that the citric acid, by coming into contact with all parts of the internal surface, would stimulate the organic contractility. Or that of M. Desgranges, by introducing a sponge dipped in vinegar, then squeezing out the fluid, and abandoning it in the uterine cavity; having previously taken the precaution of passing a silk cord through it, by which it can easily be withdrawn when deemed advisable.

Again, some persons have suggested that a piece of ice be passed up and left for a few moments in contact with the uterine surface. But the employment of this measure, as well as the external application of cold, must not be persisted in too long; because, as Madame Lachapelle has judiciously remarked, the prolonged application of snow, ice, cold irrigations, douches, and sponging with very cold water, that has been so much vaunted by some authors, is not unattended by danger to the patient; and, therefore, the use of cold ought to be restricted within moderate limits. Most generally it becomes ineffectual in the course of five or six minutes; often, indeed, it proves positively injurious, either by reducing the woman to a state of mortal torpor, or by exposing her to a violent inflammatory reaction.

There are some cases of obstinate hemorrhage, in which all the measures yet spoken of prove ineffectual. For such cases other remedies have been recommended, which now claim our attention. These are the tampon, the introduction of a bladder into the womb, the approximation of the uterine walls by immediate pressure, compression of the aorta, the use of ergot, of opium, and transfusion.

1. *The Tampon.*—Leroux reports quite a number of cases of inertia of the womb, in which the tampon arrested the flooding where it seemed to be inevitably fatal. But, as Desormeaux remarks, it often happens that men, even those who are otherwise worthy of credence, are often more successful with remedies of their own invention than any one else. In fact, the only effect of the tampon in many cases is to convert an external into an internal discharge. In order to obviate this disadvantage, it has been suggested to combine its employment with compression of the uterine walls, by means of the hands. M. Chevreul, who is favorable to its use after the delivery, adds that it is necessary to irritate the organ externally as much as possible. But in the cases mentioned, both by him and Leroux, where the tampon was apparently successful, it was not, as M. Baudelocque avers, so much in preventing the discharge of blood, and determining its coagulation, as by irritating the internal surface of the womb, and thereby producing a retraction of its vessels, that the plug could have had a salutary effect. The tampon itself, or rather the irritating substances M. Chevreul saturates it with, conjoined with external stimulation, may indeed bring on the contraction in many cases; but the mere plugging up of the vagina, as directed by Leroux, is useless, to say the least; and therefore the introduction of some old linen, steeped in vinegar, into the uterine cavity, is in reality the only efficacious part of the plan; but even this will prove still more beneficial when accompanied by compression of the hypogastrium, and by frictions and stimulations of the organ above the pubis.

2. The introduction into the womb of a hog's bladder, which has been softened by holding it a short time in warm water, is even a worse measure than the preceding; and it is really astonishing that Gardien seems to be in favor of its employment. The presence of a bladder would evidently be a continual obstacle to the retraction of the womb. Great stress has been laid upon the compression, which it might make on the vascular orifices, but to no purpose: for, even were this a constant result, which however is far from being the case, since we are never sure of filling the uterine cavity precisely, the difficulty would only be delayed, as the hemorrhage might reappear as soon as the bladder is withdrawn; and then, after all, we should have to fall back on the contraction of the organ.

3. M. Deneux conceived the happy idea of pressing the uterine walls together, in a desperate case, by means of a folded napkin, which he applied over the hypogastrium, and retained in position by a tight body-

bandage; this arrested the discharge of the blood completely. Notwithstanding M. Baudelocque has accorded the original suggestion of this plan to M. Deneux, it was long since recommended, particularly by the English writers. This procedure has been unjustly censured by certain practitioners, since it certainly may prove very useful in an extreme case. In saying that, from the disposition of the posterior plane of the trunk, the uterine walls can only be brought into contact with each other at the point corresponding to the sacro-vertebral angle, Madame Boivin has evidently confounded the bare skeleton with the one still covered by its soft parts.

4. Quite recently, M. D'Ornellas defended a thesis on the compression of the aorta as a remedy in uterine discharges, and he brings forward numerous cases in support of his theory. M. Baudelocque has assured me that he has several times succeeded in arresting a flooding in this way, which threatened an early fatal termination. This gentleman, who disputes with Dr. Trehan the honor of its revival, appears to have great confidence in the efficacy of the measure; and we may add, that a very great number of facts now militate in favor of his opinion. He recommends the compression to be made in the following manner: first, flex the patient's superior and inferior parts on the pelvis; then depress the abdominal wall immediately above the fundus of the womb with the four fingers of one hand, when the pulsations of the aorta will be more distinctly felt than the beating of the radial artery. The compression may be kept up for a considerable time without causing any particular inconvenience to the woman; M. Baudelocque states that he has persisted in it for more than four hours. This compression, however, is only considered, even by its author himself, as a mode of gaining time; for he administers ergot almost immediately, by the action of which the uterine contraction is soon established. Compression of the aorta, though long since recommended, had been generally proscribed because the modes of effecting it were very imperfect. Thus, some directed the pressure to be made through the ventral surface and the double uterine wall; while others introduced the hand into the cavity of the uterus, and then subjected the vessel to pressure through the posterior wall of this organ. But both of these modes ought to be rejected, because they impede the retraction of the womb.

Notwithstanding the numerous successes which have been attributed to this operation, several authors, amongst whom M. Jacquemier is conspicuous, contest its utility, and even go so far as to consider it injurious. "In the profuse floodings following delivery, the blood which escapes," says M. Jacquemier, "proceeds in great part from the veins, and compression of the aorta could only favor the reflux of venous blood into the vena cava and the branches which empty into it." It is not to be supposed that the utero-placental arteries could furnish the enormous amount of blood that sometimes escapes in a few moments from a recently delivered woman, and there can be no doubt that a great part of it is discharged from the large, gaping venous orifices left upon the internal surface of the uterus by the detachment of the placenta. Though agreeing with M. Jacquemier as regards this point, I cannot unite with the conclusion which he draws from it. Such, in fact, are the relations between the aorta and vena cava, that it is almost impossible, unless it be done expressly, to compress one without compressing the other. I am very willing to admit that a mistake may have been made in respect to the nature of the service thus rendered, and that all the credit hitherto accorded to compression of the aorta should be transferred to the flattening of the vena cava; but of what importance is this as regards the practical result, since the arrest of the hemorrhage is no less the consequence? M. Jacquemier has done a real service in pointing out a theoretical error, but I would almost blame him for it, should he thereby deprive the practitioner of an invaluable resource. I therefore accept his theory, but shall nevertheless continue to compress the aorta, although convinced that I shall compress the vena cava at the same time.

Still another objection has been made to the proceeding. Although compression of the aorta, it is said, may prevent the blood from arriving by the uterine arteries, it must necessarily increase the amount that passes through the ovarian arteries, inasmuch as it is generally performed below the origin of the latter. . . . The objection loses much of its value from the fact that the hemorrhage is chiefly venous. But of four arteries supplying blood, two only are permeable after compression of the aorta; so far, therefore, it is a marked advantage.

M. Jacquemier also regards the administration of ergot during the compression as useless and irrational. "How shall we admit," says he, "that this agent, whose effects are so prompt though evanescent, can stimulate the uterus, *since the arterial blood is cut off from it?*" It is by first acting upon the nervous centres and stimulating the excito-motor properties of the uterine nerves, that the drug exerts its special action on the uterus; therefore, to suppose that after having been absorbed by the stomach the medicament can only act by being carried by the circulation into contact with the uterine fibre, involves, I think, a physiological error.

Hitherto, compression of the aorta has been recommended only for the purpose of suspending the discharge of blood, and giving the measures for restoring the uterine contractility time to act. I think that it is capable of rendering great service even after the discharge is suspended and the womb contracted. The fact is, that when flooding has been profuse, all danger is not at an end from the moment that we have succeeded in arresting the hemorrhage and bringing about the contraction of the uterus; for although not a single drop of blood should be discharged afterward, the amount of this fluid remaining in the body is no longer sufficient to supply all the organs, and the brain at the same time, with the stimulus necessary to the maintenance of the integrity of their functions; so that women sometimes expire two or three hours after the arrest of the hemorrhage. Death then takes place, because the remaining blood, being equally diffused throughout the entire extent of the circulatory apparatus, the brain, and especially the spinal marrow, receive too small a proportion of it, and consequently are not sufficiently stimulated to enable them to support the respiration and the movements of the heart. This being admitted, it is easy to understand that if, by compressing the abdominal aorta, we can prevent the blood discharged by the left ventricle from descending into the lower parts of the body and inferior extremities, it will necessaril [illegible] ed to flow back toward the brain in greater quantity, and thus secure for this organ the degree of stimulus which it requires to enable it to react in its turn upon the functions of the heart and lungs.

The compression of the aorta may be assisted powerfully by placing the woman on an inclined plane, so that the head shall be the lowest part of the body.

I think, therefore, that compression of the aorta and vena cava is useful whilst the flooding continues to be profuse; but also, that when the patient has lost a great amount of blood, it should be continued for several hours after the arrest of the hemorrhage and thorough contraction of the walls of the uterus. In the latter case, however, it is important to separate the aorta from the vena cava, so that the compression may act on the former vessel exclusively.[1]

5. *Ergot* has been recommended, as stated above, as a means of preventing the occurrence of hemorrhage in women who, by their constitution and previous history, seem to be highly predisposed to it. This remedy may also be resorted to in the curative treatment; unfortunately, however, the time necessary for procuring it, and for the development of its action, is always too long to secure a sufficiently prompt effect;[2] and hence, in an alarming hemorrhage, one dependent on a complete inertia of the womb, for example, the patient would certainly die before any benefit could be hoped for from its employment. Under such circumstances, it would prove highly useful to compress the aorta in the meanwhile. But with the exception of these frightful cases, where a few minutes decide the woman's fate, the secale cornutum ought to be employed; and its use would be nearly always followed by success. (See *Therapeutics*, article Ergot.)

In some females, the uterine hemorrhages have a marked tendency to relapse. Consequently, a few grains of this substance ought to be administered as soon as it has occurred, whether it seems to be finally arrested or not. For, in the former case, it can do no harm, and, in the latter, it will prevent a return of even a partial inertia; which is not an indifferent matter to a woman who is already exhausted from the previous loss, and who is liable to succumb under a fresh discharge, however inconsiderable it may be.

6. The English authors (Burns and others) recommend the use of opium in full doses, both as a preventive and a curative remedy in cases of flooding from inertia. They bring forward some cases in support of their opinion; but I do not deem them conclusive; because, in every instance, they combine the exhibition of opium with the employment of those general measures

---

[1] Compression of the aorta was once resorted to by M. Roux in the case of a wounded patient, who was exhausted by frequent hemorrhages. I think, however, that I was, myself, the first to suggest and perform it, in the floodings of newly-delivered females. In the month of March, 1845, after stating the physiological principles upon which I based my conclusions, I proposed the operation in a formal manner, in a communication to the Medical Society of the department of the Seine. I am the more particular in stating this fact, as the same suggestion has been made in other quarters without acknowledging my priority.

[2] Accoucheurs, especially those who reside in the country, should always be careful to have with them a little ergot in the grain.

just indicated as proper for arresting hemorrhage. Besides, I cannot understand how opium, when administered alone, can have any influence whatever over the contraction of the uterus, which is here the only hope of safety.

7. *Transfusion*, which has been so highly praised by certain English writers, in whose hands it seems to have succeeded quite a number of times, has not been followed by the same success in France. It is one of those extreme measures which might be employed in desperate cases, though it cannot be relied upon; because the extent of the flooding, the extreme debility of the patient, and the slowness of its operation, generally render it ineffectual; without referring to the nervous and inflammatory symptoms, and the phlebitis, which very frequently succeed the operation. Besides, it evidently could only be practised with any chance of success after the flooding had ceased, and the uterus was thoroughly contracted, and then I think that compression of the aorta would have almost all its advantages without any of its numerous dangers. I once saw it performed at the *Hôtel-Dieu* without any benefit whatever. In some of the reported cases, a notable improvement was effected by a moderate quantity of blood (three or four ounces); in others, it was necessary to inject as much as ten, and even as high as thirteen, ounces.

In M. Nelaton's case, he injected first six, and five minutes afterwards eight, ounces of blood. The operation was conducted as follows: The median basilic vein was uncovered by an incision three-quarters of an inch in length, then isolated, and raised by a loop of thread so as to flatten it and stop the circulation in order to prevent any loss of blood. The anterior wall of the vein was next seized with a pair of forceps, and half divided obliquely from below upward, so as to form a V-shaped flap, which might be raised or restored at pleasure. The blood drawn from one of the resident surgeons was received in a dish warmed to the temperature of 77° F., and poured immediately into a syringe heated to the same degree.

Everything being thus prepared, whatever air remained in the syringe was expelled, the little V-shaped flap was raised with the forceps, the tube of the instrument introduced into the vein beneath it, and the injection performed slowly. The second injection was made five minutes afterward, and the wound in the arm closed by means of collodion.

8. We have hitherto supposed the hemorrhage to come on after the removal of the placenta; but inertia of the womb, and the consequent hemorrhage, often occurs before this, so that retention of the placenta, under these circumstances, is attended with some special indications which it is important to specify. Whenever a hemorrhage takes place, a more or less considerable portion of the placenta must evidently be detached; sometimes, even, it is wholly separated from the uterine wall, being left free and movable in the cavity of the organ. The directions given by authors in this case are very variable: thus, some advise us to extract the secundines at once, together with any coagula the uterine cavity may contain; others, on the contrary, to try first to remedy the inertia, which is the sole cause of the accident. We do not hesitate to recommend the latter advice when the hemorrhage is slight, because, if the placenta is partially removed, we would certainly augment its sources by completing the separation. Hence we look

upon it as good practice not to attempt the extraction, and more particularly the detachment of the placenta, until the accoucheur, by stimulating and irritating the organ with his hand, has secured its diminution and contraction to such an extent that it drives, as it were, the coagula and after-birth beyond his hand.

Should the adhesions of the placenta be unusually firm, the injections into the umbilical vein, spoken of in the last chapter, might be resorted to.

But when the hemorrhage is profuse, and the placenta is completely detached, or adheres to the uterus by only a very small portion of its surface, it should be extracted together with the clots which may have collected within the cavity of the uterus. Their presence there prevents an energetic action upon the walls of the womb, and may impede their contraction. Therefore, the best means of arresting the flow of blood is to empty the uterus of its contents as quickly as possible.

When the physician has been fortunate enough to overcome the hemorrhage by a resort to the various measures just alluded to, he should still continue with his patient for several hours, carefully watching the character and amount of the discharge from the vulva, and occasionally placing a hand over the hypogastrium, so as to detect any increase of volume in the uterine globe. Should the uterus become relaxed and grow larger, we may be certain that it is again filled with coagula, and the hand should be again introduced without hesitation, notwithstanding the patient's entreaties, and the contents turned out; at the same time stimulating the organ by friction upon its internal surface. The operation should be repeated until the discharge is finally arrested. He ought also to take the precaution of applying cloths steeped in vinegar or alcohol, or even in cold water, over the belly, and to retain them there by a moderately drawn body-bandage. Absolute quiet is to be insisted on. As nourishment, the patient might have some light cordial, broth, sweetened wine, &c., &c.

Usually, the patient is put to bed an hour after her delivery; but after severe floodings, she should be carefully protected from any sudden motion, and it is often necessary to let her remain in the same position for eight, ten, or twelve hours. The least movement might cause a mortal syncope.

After a profuse hemorrhage, the patient is naturally inclined to sleep; some persons think it better to prevent her from slumbering, lest the discharge be renewed without her knowledge. But as this repose repairs the exhausted forces, it ought not to be hindered; but she must never be left; for the pulse, the uterus, and the vaginal discharge require a constant oversight.

The patients are frequently tormented, after considerable floodings, by vomiting, or at least by sick stomach, nausea, and retchings. Independently of the pain they occasion, these gastric symptoms are not wholly devoid of danger; for the vomiting, from the fatigue caused by the strainings to which the woman gives way, may produce a syncope, during which the hemorrhagic discharge may be renewed profusely. If there are only the nausea and inclination to vomit, the women are often so tormented thereby as to wear out the little strength they have left; and this exhaustion of muscular power, at a time when the uterine contraction is so necessary, is a very melancholy condition. "Nothing tranquillizes the stomach under these circumstances," says Dewees, "so far as I have observed, like opium, in the solid form. A newly prepared pill of two grains of opium, with a very small portion of soap, to facilitate its solution in the stomach, should be given every hour or two, until the vomiting ceases, or the stomach becomes reconciled. I have found a sinapism over the region of the stomach of great service, and it should be resorted to if necessary."

The opiates, in a fluid form, might also be used with advantage. When after a profuse flooding the patients are excited, uneasy, or tormented by a feeling of extreme discomfort, a few dessertspoonfuls of the syrup of diacodion will generally serve to calm their anxiety, and procure the refreshing sleep which they so greatly need.

[The danger is not over with the cessation of a profuse hemorrhage, for alarming attacks of syncope are of frequent occurrence. Under these circumstances the English practice ought to be followed, which consists in the use of alcoholic drinks, such as brandy, rum, Madeira wine, &c. They may be either diluted or given pure, and a large amount can be taken without producing the least symptom of intoxication. A woman may thus drink from three to sixteen ounces of brandy in less than two hours, without the slightest inconvenience. Brandy and water, with a little lemon-juice, is often a very good preparation, because the pleasant taste renders it agreeable to the stomach.

Nothing restores more rapidly the exhausted strength of a woman enfeebled by sudden hemorrhage, than alcoholic drinks and cold broths; unfortunately, however, the stomach often rejects whatever is taken into it. To quiet this vomiting, fragments of ice, always taken with avidity, may be administered. Should the vomiting prove intractable, absorption by the large intestine, through the use of enemata, may be attempted, and an injection given of broth and wine, with the addition of from 15 to 20 drops of laudanum. Dr. Charrier, former clinical chief at the hospital of the Faculté, published several cases which seem to prove the utility of these injections, and I can myself bear witness to their efficacy. Therefore, in serious cases, they should not be overlooked.]

As the patient begins to recover from the extreme weakness which immediately follows a profuse loss of blood, symptoms of febrile reaction begin to appear: the pulse is small and rapid, sometimes hard, and sometimes compressible; the heat and dryness of skin are increased, the tongue is dry, and the features contracted: the patient is very thirsty, and feels disgust for solid food: she is startled by the least sound, or by a bright light: she complains of violent headache, and sometimes of palpitations and dyspnœa. She is unable to sleep, or, if she dozes, is liable to be awakened by violent startings.

This condition evidently results from the excitement of the nervous system occasioned by the loss of blood, an excitement which we should endeavor to calm from the outset.

Evidently, the first indication is to repair the losses of the organism by food which shall be easily digested, and frequently administered in small quantities at a time. Broths or light soups are eminently suitable.

The best means of calming the excitability of the nervous system are perfect rest, cold aspersions upon the hands and face, but especially opiates, given frequently and in small doses.

§ 2. Secondary Hemorrhage.

In order to complete the history of puerperal hemorrhages, we have yet to speak of some accidents which occur at a variable period after delivery, and which on that account have been styled *secondary hemorrhages.*

These floodings, which are so profuse as seriously to endanger the health and sometimes even the life of the patient, have been treated of very imperfectly in the most recent treatises, and we ourselves committed the mistake of passing it over with a very slight notice in the earlier editions of this work. Dr. Clintock has recently performed a valuable service in calling attention to the various circumstances which may give rise to them. Sometimes these causes begin to act very shortly after the delivery of the placenta, and the thorough contraction of the uterus, sometimes not until after two or three days, and occasionally even after three, five, or six weeks. But at whatever time their influence is manifested, their mode of action is nearly always the same as at the other periods of the puerperal state; and the hemorrhage may then be accounted for either by secondary inertia, by a too active congestion, a real *molimen hæmorrhagicum*, or, finally, by an alteration of the blood, consisting in a great increase of its fluidity.

The hemorrhage, or rather the inertia which produced it, is not confined to the period of delivery, or to that which immediately succeeds it; so that as regards the time of its appearance, we may distinguish a primitive inertia, which is that just described, and a secondary, to which attention has been especially called by Ramsbotham, and of which we have ourselves observed several examples.

A. *Secondary Inertia.*—Some moments, hours, and sometimes even several days after delivery,[1] the uterus, which had contracted properly and had remained so during all that time, may suddenly become relaxed. Its walls become softer, and it increases in size. At the same time the patient grows weak and pale, the pulse loses its strength and quickens, and if the genital parts be carefully examined, it is found that very little blood is discharged, and that the clothes are but slightly soiled. But if the uterine tumor be compressed slightly, or the organ be incited to contraction by friction upon the hypogastrium, a considerable amount of coagulated blood is suddenly discharged by the vagina. After this evacuation the size of the uterus is diminished, it is harder, and remains so, so long as the hand continues to press upon it; but if the pressure be removed, the softened walls are soon found to become distended afresh, and then contract again, driving out another quantity of clots, provided the accoucheur renews the pressure and frictions calculated to excite their contractility. This series of occurrences may take place several times, if the accoucheur relinquishes too soon the use of the proper means for making the uterus contract permanently; and if the cause of the hemorrhage should not be discovered, it might cost the woman her life.

---

[1] Mr. Fergusson reports (*New York Medical Journal*, Sept., 1850) a case of grave hemorrhage occurring thirteen days after delivery. The cause was secondary inertia. The author examined statistics in reference to this subject, with the following result: out of 16,654 labors observed by Collins in the Dublin Hospital, there were 43 cases of hemorrhage immediately after delivery, and 40 twelve hours afterward. The flooding, in one case, occurred only on the fourth, in another on the sixth, and in still another on the tenth day.

Drs. Clintock and Hardy observed one on the seventh day, and Dr. Stimever another on the tenth.

Now several circumstances are liable to lead into error. In the first place, the physician had previously ascertained the condition of the womb, and it does not immediately strike him that it may have become relaxed in a secondary manner, after having remained so long properly contracted. Again, it frequently happens that the patient, exhausted by the fatigues of the labor, falls asleep, and does not herself perceive her extreme weakness, until her condition has become irremediable.

Nothing but an examination of the uterus is capable of clearing up the diagnosis. This organ is then found to be much larger than it was after the labor, and the finger carried up to the internal orifice, finds it blocked up by a clot of considerable size.

The accoucheur should use every effort to procure the contraction of the walls of the uterus, and especially to render it permanent. The best way of accomplishing this is, to continue the pressure himself which was made at the outset by the hand on the fundus of the womb, and afterwards substitute for it permanent compression. For this purpose, several napkins folded on each other are placed on the fundus of the womb, and by means of a body-bandage tightly applied, the organ is held strongly pressed against the opening of the superior strait. I am in the habit of administering immediately fifteen grains of ergot, and of repeating it every half hour or hour, according to the degree of tendency to relaxation, in doses of from six to eight grains.

B. *Congestions of the Uterus.*—Under this title, Madame Lachapelle has described a flooding, which comes on some time subsequent to the parturition; and which is produced, as she supposes, under the influence of a peculiar *molimen hæmorrhagicum.* This variety is occasionally developed even without any inertia of the womb. "We have known," she continues, "a woman to perish seven or eight days after her confinement, from a profuse discharge of serous blood, which transuded from all parts of the utero-vaginal surface, and saturated, by imbibition, the most solid tampon; the womb was soft, but not distended with the blood." I have twice known hemorrhage to take place after the delivery of the after-birth, says M. Velpeau, although the womb had been contracted in the one case for four and in the other for seven hours. He further states that this accident is occasionally manifested subsequent to the first twenty-four hours.

These congestions, which in certain rare cases are inexplicable, may usually be attributed to certain easily detected, general, or local causes.

We have already spoken (page 877) of the liability of the retention of a portion of the placenta to give rise to these hemorrhages, and we would now simply add that the presence of a large clot within the womb might have the same effect. Both Collins and Madame Lachapelle report cases of flooding coming on eight and ten days after delivery, and which ceased only upon the artificial extraction of the coagula.

The determination of blood may also be occasioned by the retention of a portion of the membranes, as in the following case.

I was sent for by a physician to see a lady living in Rue Gros-Caillou. On arriving there, I found M. P. Dubois, who was called at the same time, but who preceded me, engaged in extracting a considerable portion of the membranes, which had been imprudently left behind whilst delivering the placenta. The child was born at nine P. M., and half an hour afterwards hemorrhage came on, which could not be arrested until half-past one in the morning, at which time the foreign body was extracted. The uterus had remained perfectly contracted throughout. (See also page 879.)

The extraction of the foreign body, in the latter case, generally dissipates the symptoms; in the former, a resort to revulsives to the upper part of the body, to cold applications, and even to venesection, is evidently indicated. These will be materially aided by a regulated diet, and absolute rest in the horizontal position.

Intra-uterine polypi have several times given rise to mortal hemorrhage two or three weeks after delivery. It has been thought that these bodies occasion the flooding only by preventing the contraction of the uterus. We are disposed to reject this opinion, because, as Oldham observes, in these cases the strongly contracted uterus can readily be felt above the pubis. Besides, the cessation of the flooding after ligation of the polypus without excision, justifies the belief that the latter does not act simply as a foreign body; for were it so, the discharge would continue after the ligature was applied.

Irritation of the neighboring organs may give rise to hemorrhagic congestion of the uterus. M. Moreau mentions a case of hemorrhage which occurred on the eighth day after delivery, and which he very properly attributed to a collection of hardened fæces in the large intestine. Injections were used without advantage, and he was obliged to empty the rectum by using a sort of scoop. As soon as this was accomplished, the discharge ceased.

For a long time after delivery the uterus continues to be a centre of fluxion, toward which the general disorders of the economy seem to converge. There appears to be no other way of explaining such floodings as are apparently due to violent moral emotions, the abuse of stimulants, &c.

C. *Alteration of the Blood.*—M. Blot also mentions, in his excellent thesis, the case of a woman whose uterus was firmly contracted, and who died in consequence of a sero-sanguineous discharge succeeding flooding after delivery. This hemorrhage, which nothing was capable of arresting, is attributed by M. Blot to albuminuria and the consequent impoverishment of the blood. I have already had occasion to remark, that new observations are necessary to prove the correctness of this assertion.

I cannot, however, agree with Madame Lachapelle, who thinks that these floodings are produced by an accidental congestion, a sort of *molimem hæmorrhagicum.* I think, on the contrary, that they are the result of a serous condition of the blood, preventing the formation of obliterating coagula, and allowing the fluid to exude from the internal surface of the uterus. This sometimes takes place from the surface of wounds in certain patients affected with anæmia, scurvy, &c. But to admit with M. Blot that it is caused by albuminuria, would be going rather too far.

The use of the tampon, assisted by compression of the uterus by means of a bandage drawn tightly around the abdomen, would be proper under these circumstances. Ergot has often been used, without any advantage whatever, in these dangerous cases. Some English physicians approve highly of styptics taken internally. In a case of flooding occurring nine days after delivery, Mr. Clintock used the tincture of Cannabis Indica with success. Oxide of silver is also recommended, in the dose of from half a grain to a grain, three or four times a day, in connection with a small quantity of opium. A large blister over the sacrum has also been applied successfully.

§ 3. Hemorrhage from the Umbilical Cord.

In twin pregnancies, hemorrhage may take place from the cut placental extremity of the cord, after the first child is born. For although no vascular communication habitually exists between the two placentas, yet the contrary has been too often observed to leave any doubt with regard to the fact at the present day; and hence it is admitted by most practitioners. Besides, we find cases recorded by Méry, Baudelocque, and Solayres, which fully prove that, even in single pregnancies, a hemorrhage profuse enough to endanger the mother's life may occur after the division of the cord, as also that the umbilical vein is the sole source of this discharge. "As regards the bleeding from the placental end of the cord, other than in cases of twins, I can aver," says M. Chevreul, "having observed it three times in women whom I had delivered with the forceps; having cut the cord in a hurry without applying any ligature, the blood continued to flow abundantly from that portion connected with the placenta, whilst I was devoting the necessary attentions to the child. I resorted to all the modes of irritation advised in such cases, for the purpose of rousing the contractions; but the discharge was only arrested by tying the cord. The delivery of the afterbirth shortly occurred, and was followed by no untoward accident." Quite recently, M. Guillemot has met with a very similar case. Dr. Albert, of Wiesentheid, saw the blood spring from the extremity of the cord, in a stream as thick as a straw. The hemorrhage, which was considerable, could not be arrested except by pressure upon the umbilical vessels; and a ligature had to be applied.

By reflecting on the mode of vascular connection heretofore studied in the placenta, it really seems impossible to understand how the mother's blood, in a natural condition of things, can pass into the ramifications of the umbilical vein, and thence escape in such profusion. But are we on that account to reject such facts, advanced by experienced men of high standing? I think not; besides, the explanation would be rendered very intelligible by supposing some vascular anomaly in these exceptional cases. I therefore consider hemorrhage from the placental extremity of the cord as possible, for I cannot question the testimony of the imposing authorities just quoted. Under such circumstances, ligature of the cord is evidently the only resource.

§ 4. Inversion of the Womb.

This is an affection in which the fundus of the organ, being indented or depressed, is more or less inverted into its cavity, or even passed down through the os uteri into the vagina, or out at the vulva.

Inversion of the womb exhibits many different degrees; from a simple depression of the fundus to complete inversion, in which case the organ is turned inside out, the internal or mucous surface becoming the external one, and *vice versa*. For the purposes of description, we shall admit three principal degrees: in the first of which the fundus is simply depressed, approaching to, but not engaging in, the os uteri; the second is a partial inversion, in which the fundus actually engages in the orifice, and protrudes into the vagina; and the third is a complete inversion, in which the uterus is turned inside out, appearing at the vulva, or even protruding beyond it.

1. When the depression commences at the fundus, a concavity is produced in the tumor above the pubis, having its highest borders nearer to the latter than to the sacrum; or it may commence at the sides; and when it is the front one that is indented, the posterior border is higher than the anterior, but when the reverse happens, the posterior is the lower; again, when it is depressed laterally, the concavity in the top of the womb is inclined towards one of the iliac fossæ. If the placenta is still undetached, the indentation is augmented by pulling on the umbilical cord. Finally, when the finger is passed into the cavity of the womb, it finds the fundus within half an inch, more or less, of the orifice.

2. When the inversion is partial, we can detect a hemispherical tumor by vaginal examination, varying in its size, according to whether the placenta is detached or still adherent; the neck of the womb encircles this tumor at its upper part like a collar. The ball usually formed in the hypogastric region by the uterine globe, is no longer felt on palpation; a considerable depression being found in its place.

3. Where it is complete, the tumor may either fill up the vagina without passing beyond the vulva, or may hang down between the woman's thighs. In the former case, the whole vaginal cavity is occupied by a voluminous tumor, the upper part of which can scarcely be reached; in the latter, which is the most serious of all, the pelvic cavity is altogether empty, and nothing can be felt there by the hand; but a large tumor is found between the patient's thighs, having the placenta attached, wholly or in part. The top of this tumor is either simply concealed between the labia, or extends up into the vagina. In some instances, the latter has also been implicated in the displacement, and has been inverted in a great measure, thereby giving a considerable length to the tumor. "We cannot, however, say that the inversion is strictly complete," says Burns, "for, in most cases, the lips of the os uteri hang down, and the inversion terminates at the lower part of the cervix." Some writers assert, notwithstanding, that the lips may be completely inverted.

This accident is always accompanied by general phenomena, which are the more serious as it is the more considerable. The patient not only suffers from pain, but she is harassed by a constant desire to urinate, and by strainings at the close-stool, which are often sufficient to render an inversion complete, that would otherwise have only been partial. The pain becomes excruciating, and the frightened sufferer falls into a state of syncope; the pulse is feeble, and sometimes is nearly or quite imperceptible. The intensity of these general phenomena varies with the state of retraction or relaxation of the cervix, and with the degree of inversion. For instance, it is much less in a simple depression, than where the inversion is more complete. Furthermore, the pains and dangers are much greater in the latter case, if the cervix uteri is firmly contracted, than when it is dilatable. Again, should the placenta be partially detached at the time of the accident, there will be a profuse hemorrhage; but, on the contrary, when it is firmly adherent throughout, no discharge occurs, since the latter only begins with the separation of the after-birth, and increases as this progresses. Lastly, when the inversion is complicated by inertia, which unfortunately is usually the case, the flooding is frightful, and can only be moderated by the contraction of the womb.

Inversion is sometimes produced by attempting to effect the delivery of the after-birth before it is entirely separated, by pulling imprudently on the cord. It may also result from a very rapid labor, more particularly if the woman happens to be standing at the time when the child is born; for if the umbilical cord is unusually short, or is wound around some part of the child, the fundus may be pulled down by the strain on the cord, and thus become inverted.

Inversion from this latter cause is far more unusual than one would suppose; because the cord is generally broken under such circumstances, incomprehensible as the fact may seem, when we reflect on the amount of force required to rupture it. The rarity of the inversion, however, is more readily explained by the powerful contraction at the instant the fœtus is expelled, and by the difference in the line of axis of the two straits; the axis of the superior strait forming nearly a right angle with that of the inferior one, or rather with that of the vulva. In other words, the cord passes around the posterior part of the symphysis pubis, as over a pulley; and, therefore, the greater amount of the tractive force is spent on the symphysis before reaching the fundus.

It may happen, from the uterus being in a momentary state of inertia after delivery, that the pressure made by the intestinal mass indents its fundus like the bottom of a bottle. Again, in cases of complete inertia, should the placenta be attached directly to the fundus of the organ, its weight alone might pull it down. Such accidents are usually corrected by the force of the contractions; though, should the operator pull on the cord before noticing the depression, he might increase the difficulty by converting it into a partial inversion.[1]

---

[1] Although I am only treating of uterine inversion here, as a complication of the delivery, I cannot refrain from mentioning a very curious case, narrated by Ané, at the *Société de Médecine*, of a woman who had a complete inversion of the womb twelve days after the confinement, and which resulted in consequence of severe strainings at stool. This case, which was confirmed by Baudelocque, who was called in consultation, can leave no doubt as to the possibility of such an accident, however extraordinary it may appear. A still more wonderful case is related by Mr. Ebenezer Skae, as occurring in a woman who suffered complete inversion of the womb two days after

Dr. Tyler Smith supposes that inversion of the uterus is always occasioned by irregular contractions of the organ; even in the cases generally attributed to premature tractions on the cord, he considers, that the pulling does not act mechanically, but only by producing an excitement of the fundus of the uterus, where the placenta is inserted, which occasions an irregular contraction, and consequently a simple depression. This first degree of inversion, according to him, is immediately followed by a sudden contraction of the fibres above the depressed point, which tend by their action to expel the latter through the cervix, in absolutely the same manner as they would act upon a foreign body.

Dr. Smith's explanation of the mechanism of inversion may be true for some cases; but when the walls of the uterus are in a state of complete relaxation, it is difficult to allow that violent pulling upon the cord of an adherent placenta should be incapable of producing inversion.

When a simple depression occurs immediately after labor, it will scarcely attract attention, unless the placenta happens to be detached, and a hemorrhage is thereby developed. It ought to be reduced, as soon as detected, by placing the patient on her back, and having the abdomen and breech raised higher than the chest; the legs and thighs are flexed and held apart, and the head inclined forwards on the breast; then the operator carries his hand into the uterine cavity, and gently pushes out the fundus with his fingers.

M. Chevreul sums up so well the indications presented by the partial and complete inversions of the womb, with reference to the delivery of the afterbirth, that I cannot do better than transcribe here his remarks on this subject. He says: "A partial inversion is easily reduced when detected shortly after its occurrence. Of course, the placenta may either be separated wholly or in part, or it may be still adherent throughout to the womb, at the time of the accident. If wholly detached, the hemorrhage is very profuse, and requires immediate attention. The accident is remedied by placing the woman in a suitable position, and then, introducing the whole hand into the vagina, the fingers take hold of the inverted portion of the womb and endeavor to return it, by first pushing up the part that came down last. Should the placenta be partially detached, and the remaining adhesions be feeble, its separation ought to be entirely completed, by passing the fingers between it and the uterine wall; after which, the reduction is to be effected

---

aborting in the fourth month of gestation. (*The Northern Journal of Medicine.*) I will further add, that the observations of Sabatier would seem to prove that such an inversion may not only take place when the fundus of the womb is depressed by a polypus, but also in a state of perfect vacuity. The responsibility of the assertion must rest with the author.

M. Roussel communicated a case to M. Martin, in which the inversion did not take place until nine hours after delivery. The patient had a frightful flooding at the time of the extraction of the placenta, which M. Roussel arrested by the ordinary measures; after which, he remained with her until fully satisfied of the contraction of the womb. It was then about eight o'clock in the evening. At five the next morning, he was summoned in great haste; when it appeared that the patient had got up to evacuate her bowels, and the womb immediately fell down to the vulva. On his arrival she was senseless, and the pulse imperceptible; the finger, passed into the vagina, found there a large tumor, formed by the inverted fundus, around which the os uteri had firmly contracted, and doubtless had thus contributed to the diminution of the hemorrhage.

complete, that would otherwise have only been partial. The pain becomes excruciating, and the frightened sufferer falls into a state of syncope; the pulse is feeble, and sometimes is nearly or quite imperceptible. The intensity of these general phenomena varies with the state of retraction or relaxation of the cervix, and with the degree of inversion. For instance, it is much less in a simple depression, than where the inversion is more complete. Furthermore, the pains and dangers are much greater in the latter case, if the cervix uteri is firmly contracted, than when it is dilatable. Again, should the placenta be partially detached at the time of the accident, there will be a profuse hemorrhage; but, on the contrary, when it is firmly adherent throughout, no discharge occurs, since the latter only begins with the separation of the after-birth, and increases as this progresses. Lastly, when the inversion is complicated by inertia, which unfortunately is usually the case, the flooding is frightful, and can only be moderated by the contraction of the womb.

Inversion is sometimes produced by attempting to effect the delivery of the after-birth before it is entirely separated, by pulling imprudently on the cord. It may also result from a very rapid labor, more particularly if the woman happens to be standing at the time when the child is born; for if the umbilical cord is unusually short, or is wound around some part of the child, the fundus may be pulled down by the strain on the cord, and thus become inverted.

Inversion from this latter cause is far more unusual than one would suppose; because the cord is generally broken under such circumstances, incomprehensible as the fact may seem, when we reflect on the amount of force required to rupture it. The rarity of the inversion, however, is more readily explained by the powerful contraction at the instant the fœtus is expelled, and by the difference in the line of axis of the two straits; the axis of the superior strait forming nearly a right angle with that of the inferior one, or rather with that of the vulva. In other words, the cord passes around the posterior part of the symphysis pubis, as over a pulley; and, therefore, the greater amount of the tractive force is spent on the symphysis before reaching the fundus.

It may happen, from the uterus being in a momentary state of inertia after delivery, that the pressure made by the intestinal mass indents its fundus like the bottom of a bottle. Again, in cases of complete inertia, should the placenta be attached directly to the fundus of the organ, its weight alone might pull it down. Such accidents are usually corrected by the force of the contractions; though, should the operator pull on the cord before noticing the depression, he might increase the difficulty by converting it into a partial inversion.[1]

---

[1] Although I am only treating of uterine inversion here, as a complication of the delivery, I cannot refrain from mentioning a very curious case, narrated by Ané, at the *Société de Médecine*, of a woman who had a complete inversion of the womb twelve days after the confinement, and which resulted in consequence of severe strainings at stool. This case, which was confirmed by Baudelocque, who was called in consultation, can leave no doubt as to the possibility of such an accident, however extraordinary it may appear. A still more wonderful case is related by Mr. Ebenezer Skae, as occurring in a woman who suffered complete inversion of the womb two days after

placenta, should ever be resorted to in women who have previously suffered from this accident. In cases of this kind, many practitioners prefer the introduction of the hand into the uterine cavity, so as to act directly on the placenta itself.

Such patients ought also to be advised to remain in bed for a long time after their confinement; and, by the use of mild laxatives, to obviate the necessity of strainings at stool.

§ 5. RUPTURE OF THE WOMB.

Rupture of the uterus is one of the most terrible accidents that can occur in the course of pregnancy or parturition. But as it only claims our attention here, with reference to the difficulties it may create in the delivery of the after-birth, we shall not revert to the minute detail already given in the Fifth Part of this work. (See p. 732.) Several different conditions may here be met with; as, for instance, the child, having partially or wholly escaped into the peritoneal cavity, has permitted the organ to retract; and this retraction of its walls may have driven the placenta into the vagina, and then beyond the vulva;[1] or the placenta may remain adherent to the internal surface of the womb, the child having passed into the peritoneal cavity; or again, it as well as the fœtus may have passed entirely into the cavity of the abdomen. In the former case, there is evidently nothing to be done. In the second, if gastrotomy is resorted to, and it is found impossible to withdraw the placenta through the double wound in the abdomen and womb, owing to the closure of the lips of the uterine rupture, it would be advisable to cut the cord as soon as the child is extracted; and then, by means of some long, solid, and flexible instrument, to bring down the cord through the rupture, the cervix, and the vagina, and out at the vulva; after which the delivery of the placenta is to be effected in the usual way. In the third case, when the after-birth has passed into the peritoneal cavity along with the fœtus, it ought to be extracted immediately after the latter, either by the natural passages, if the child is removed in that way, or through the abdominal incision, if a resort to gastrotomy be deemed necessary.

§ 6. ECLAMPSIA.

For an account of convulsions occurring during the delivery of the after-birth, see the article on *Eclampsia* (p. 788).

---

[1] This spontaneous expulsion may take place either immediately after the accident, or not for several days; as occurred in the case reported by Saucerotte. (*Mélanges de Chirurgie*, t. ii. p. 295.)

as in the former case. But if it is still adherent throughout, the whole is to be returned together; and then we may either wait for the spontaneous delivery of the after-birth, or we may attempt to separate it by the hand, according to circumstances."

Where the inversion has existed for several hours, it occasionally happens that the protruding portion of the womb is strangulated, as it were, by the os uteri, which constitutes a serious obstacle to its reduction. Under such circumstances, it is not advisable to use forcible attempts to surmount the difficulty, lest some serious accident might result; but rather to have recourse to venesection, to tepid bathing, to fomentations, to the use of the ointment or the extract of belladonna, and opiates; in a word, to all the means likely to relieve the constriction of the os uteri, and to moderate the force of the inflammatory symptoms. The inhalation of chloroform, which has been used with such fortunate results in analogous cases by MM. Barrier, Valentin, Charles West, and G. Gonney, might here also be of very great service. But if still unsuccessful, the patient will have to endure this disgusting infirmity for the remainder of her days.[1]

Where the inversion is complete, and the placenta is detached, we must first apply a soft and dry napkin upon the tumor, and then, having brought the fingers together in the form of a cone, depress its central part with their points, so as to make the fundus and body of this viscus gradually pass up through its orifice, and thus regain its primitive position. Should the conjoined fingers prove too bulky, the stick proposed by M. Depaul might be substituted for them with advantage. When the womb is once reduced, the napkin should be withdrawn. Should the placenta be partially detached, its separation is first completed, and then the operation is terminated in the same way.

Again, if the adhesions are very extensive, or if they exist throughout, we ought to attempt the reduction of all together, by proceeding as in the first case, excepting the use of the napkin; but if the orifice is not dilated enough to permit the womb to pass through with the placenta, it would be necessary to separate the latter, and then reduce the former as promptly as possible.

Whatever be the degree of inversion, the hand is always to be kept in the womb for some time after the reduction, for the purpose of preventing a return of the accident, and for soliciting the contraction of the organ. The inertia, if present, must be remedied by the appropriate measures.

It is found by experience that whenever inversion has occurred in a former labor, it has a tendency to be renewed at the subsequent ones. Consequently, no tractions on the umbilical cord, with a view of extracting the observations of the author have satisfied him that this fungus appears chiefly in the summer season, after heavy rains, and that it is developed in the grain itself between the integuments and the perisperm. At first it is invisible, but soon increases in size, and breaks through the envelopes of the grain, while the perisperm, which was very small and white, assumes a violet hue, then elongates, or grows, and becomes hard and brittle, escaping from between the paleæ (the husk or chaff), and pushing before it the fungus (sphacelia) found at its free extremity. This fungus is soft and yellow, of a disagreeable odor and a sweetish taste; being formed of several lobes joined at their centre, its surface exhibits some small undulations, similar to the convolutions of the brain. If a particle of it be placed in water, under the microscope, it is found to become partially liquefied, and the water holds in suspension an immense number of little grains, or spores, which are oval, transparent, and exceedingly minute in size. These facts, which my learned friend, Dr. Léveillé, has kindly made me witness, leaves no doubt on my mind as to the nature of this affection; and I am satisfied that it is a true fungus, and a perfectly distinct part of the *sclerotium clavus*. This fungus is rarely met with on the spurred rye found in the shops, as it has probably been detached either by the threshing or by the friction of the heads against each other. As this product is soft and diffluent, it spreads over the teguments and the spur, where it becomes dried and cracked, and forms a thin layer of a dirty white or yellowish color, which dissolves when thrown into water. Now, does the ergot owe its properties to this fungoid portion, or to its own proper substance? Experience has not yet settled the doubts of M. Léveillé on this subject; but as, by the aid of this theory, we can readily explain why the ergoted rye so often proves worthless when administered, we believe the choice of this substance is not an indifferent matter; therefore, such grains as have a smooth and brilliant surface, as well as those that exhibit numerous deep fissures, should be rejected, for the one has been deprived of the sphacelated portion by friction, and the other altered by successive rains and heats. The preference should be given to those which still have the fungus on their summits, and the surfaces of which are entire, of a violet color and dirty aspect, and covered, as it were, with a powder.

---

[1] However, two cases are reported, the one by M. Delabarre (*Acc. de Chir.*), and the other by Baudelocque, which fully prove that spontaneous reduction of the womb may take place, even after it has been completely inverted for a long time.

M. Daillies endeavors to explain this natural reduction, in his excellent thesis, by the tonicity of the Fallopian tubes, and of the round and broad ligaments; which, after having been drawn down at the moment of the accident, will necessarily return to their proper position in the course of time; and thus, by acting on the organ that involved them in its descent, will gradually elevate and return it to its original position.

§ 2. THERAPEUTICAL ACTION.

The action of this medicine is too well ascertained at the present time to permit it to be any longer called in question; though we have only to speak of it here in its obstetrical relations.

Ergot is now recommended by accoucheurs for arousing or accelerating the uterine contractions during labor, and for preventing or remedying inertia of the womb and the hemorrhage which so often accompanies it, after delivery. This action is prompt, and is recognizable by the following signs: the uterine contractions are observed to become more active in the course of ten to fifteen minutes after its administration, more frequent and energetic if they were previously slow or feeble, and reappearing if before suspended. Now, we cannot believe, like the authors who proscribed this medicine as useless, that this is merely a simple coincidence, and that the labor would have been restored without its use, for the thousands of instances in which its administration has always been followed by the same uniform result, will not permit us to consider the latter as the mere effect of chance; and, besides, all those who make use of this article know full well that the contractions which attend the exhibition of ergot have a peculiar character that cannot be mistaken; for as soon as its action is felt they become permanent instead of intermittent; the uterine globe remains hard and contracted, and the pains are continual, though they are marked, it is true, by exacerbations, or paroxysms, and there are moments, as in ordinary labor, when the patient does not appear to suffer at all, and others where she makes loud cries or bearing-down efforts. The periods of repose are, however, only apparent, for the womb is constantly contracted on the product of conception, and the hand, if applied over the belly, always finds this organ in a remarkable state of hardness; there is not that regular succession of repose and contraction which is constantly observed when the labor is spontaneous; and we may further add, that the patients themselves detect a great difference between the pains excited by the medicine and those previously felt in the same or former labors, and they bear them, as a general rule, more impatiently than the latter, complaining particularly of the want of respite. In an hour or an hour and a half after the exhibition of the ergot, its action wears away and soon disappears, so that, if there is any necessity, it must be again renewed, or recourse be had to artificial means for terminating the labor.

The permanent character of the contractions produced by ergot makes them very dangerous to the child when they are long continued. The violent retraction of the muscular fibres then renders the circulation difficult, and sometimes even impossible, in those vessels which are distributed between their various layers, and we may readily understand that the fœto-placental functions must be remarkably obstructed. Therefore, it can be prudently administered only when a prompt termination of the labor can be predicted.

This remedy is only to be given during parturition, when the pelvis is well formed, the infant presenting by its cephalic or pelvic extremity, and of course when the position is well ascertained; where no serious obstacle exists at the uterine orifice, in the vagina, or at the external parts; that is to say, when the cervix uteri is sufficiently dilated, or at least soft, supple, and patulous enough to admit of dilatation, or where the membranes are ruptured. On the other hand, its administration ought to be avoided as much as possible in primiparæ, and, if it should become necessary in them, the perineum must be supported with the greatest care, lest it be exposed to a considerable rupture should the delivery prove rapid; in very irritable women, who may have had convulsions either during gestation, or in their previous labors, because the ergot often produces a state of nervous excitement in such persons, which occasionally amounts almost to mania; in plethoric patients, suffering from congestion about the head, which is characterized by flushing and turgescence of the face, by injection of the eyes, headache, &c., &c.: in a word, in all those cases where venesection is obviously indicated; and lastly, in all those women, where the womb, from being endowed with an acute degree of sensibility, is in a state of irritation, and is habitually the seat of pains, or who, in a former labor, might have been affected with an inflammation of this organ.

The spurred rye has likewise been employed successfully in the profuse hemorrhages that follow abortion, which are caused by the retention or tardy separation of the placenta; as also for the floodings that take place after the expulsion of the fœtus, whether before, during, or subsequent to the delivery of the after-birth. We have had occasion, in the article on Hemorrhage, to refer to and insist on its use under such circumstances. The question now arises, can the ergot, which possesses in so high a degree the property of stimulating the enfeebled contractions, and of arousing them when suspended,—can it develop them where they have not yet existed? If we might judge from certain experiments made for this purpose, by Professor Dubois, in our presence, at the Clinique, in 1837, we should answer this question in the negative;[1] but it must be confessed that those trials were not sufficiently numerous to enable us to decide it positively; and although this article has seemed to possess the abortive property in some instances, yet in many others it has proved wholly inefficacious.

Again, it has not been observed that abortions are of more frequent occurrence in those countries where the bread of the inhabitants contains a certain quantity of ergot; but habit, perhaps, might explain its want of action here.

This medicine is employed under divers forms; and the powder, the infusion, the decoction, the aqueous extract, or alcoholic extract, ethereal tincture, or the syrup, may be used, almost indifferently; although in France scarcely any other preparation than the powder, the infusion, or decoction, is ever employed. Thus, it is customary to administer two or three doses of the powder, consisting of eight or ten grains each, diffused, at the time it is given, in two ounces of pure or sugared water, or a little wine and water, or some slightly aromatic infusion; and these doses are repeated at intervals of ten minutes. If the contraction is manifested after the second dose, as most usually happens, the third need not be given. Some accoucheurs administer it in a small quantity of white wine or tincture of canella, and other excitants; and it has been advised to add a small quantity of opium to prevent the medicine from being rejected, though, where the patient either vomits or seems disposed to vomit during the labor, it is better to administer it, as M. Dubois recommends, by injection, and the dose might then be increased a little.

The infusion is prepared by diffusing two scruples of the powdered ergot in a glass of water for ten minutes; or, if the article is merely bruised, without being powdered, three or four scruples may be infused in the same quantity of menstruum. In conclusion, we shall not again repeat what was said in the commencement of this article concerning the physical characters that distinguish good and genuine ergot, but we will only add that the apothecaries ought to be cautioned to have the drug freshly pulverized; and as, notwithstanding our earnest recommendations, they will not all take the proper precautions, the accoucheur would do well to always carry a few grains with him, so as to have it at hand in case of necessity.

---

[1] Such also was the opinion, at the time, of the honorable professor alluded to; but, since then, new experiments have somewhat modified his views; for we have heard him affirm, at the Academy of Medicine (in March, 1840), that, in certain cases, the ergoted rye might bring on the regular pains; and, in consequence, he classified this medicine among the measures calculated to produce a premature artificial delivery. But this opinion does not appear to us to be based on a sufficient number of facts to warrant its general adoption.

CHAPTER II.

OF THE EFFECT OF BLEEDING AND A DEBILITATING REGIMEN UPON THE DEVELOPMENT OF THE CHILD.

As the fœtus, during its intra-uterine existence, necessarily derives from its mother the means of nutrition, it was natural to suppose that her emaciation, brought about by restricted diet and frequent evacuations by blood-letting or purgation, might have the effect to retard the development of the child. This supposition has not, however, always been confirmed by experience; for women, exhausted by disease, or the severest diet, have been known to have very large and robust children, whilst others who had become stout and strong during pregnancy, and who had gained thirty pounds in weight, gave birth to very medium-sized children (Baudelocque).

This observation of Baudelocque's, the truth of which has been many times proved, has dispelled the idea of using purgation, bleeding, and diet, as an obstetric means in cases of contracted pelvis. With the exception of M. Moreau, no one in France thought of having recourse to this method, when M. Depaul published, quite recently, two very interesting observations tending to prove its efficiency. Fortunate results had indeed been mentioned by others. Thus Dewees, who states that he had often seen mothers in consumption give birth to very robust children, and who was not, therefore, *a priori*, favorably inclined towards the method, nevertheless quotes a letter addressed to him by Dr. Holcomb, in which five cases are reported. Four of these five women had never been able to have living children, and one of the four had lost eleven. These five were very early subjected to the daily use of purgatives, and were all delivered of living children. Dr. Ritter relates the case of a woman with a contracted pelvis, who was several times delivered of dead children, with great difficulty. From the fourth month of her fourth and fifth pregnancies, she was subjected to repeated bleedings, to the use of a slightly purgative mineral water, and severe diet, composed chiefly of a small quantity of vegetables, milk, bread, and fruits, without meat, eggs, or dried vegetables. The children, which were much smaller than usual, were extracted quite easily, but were still-born. One, which presented by the feet, died whilst the head was retained by the contraction, and was expelled spontaneously. The other presented the arm, and had to be turned; it was necessary to extract the head by the forceps.

These cases, though certainly encouraging, are not sufficiently numerous to establish the value of this method.

Admitting, for an instant, that a severe regimen, assisted by bleeding and repeated purgation, would always have the effect upon the development of the child, which it appears to have had in the preceding observations, should this method be preferred to the induction of premature labor?

The latter operation, though almost always innocent as regards the mother, is frequently fatal to the child: thus, of 225 cases mentioned by M. Lacour, 37 of the children perished. According to M. Stoltz, but half of the children are saved; and judging by my own cases, and those which I have witnessed, the mortality of the children is even greater.

Unfortunately, we have not yet enough cases in which the regimen has been employed, to establish a comparison. However, out of the ten cases mentioned, we have only two dead children, and this may be partly accounted for by the mode of presentation. Therefore, this method appears to afford greater chances to the children.

It is greatly to be feared that the same cannot be said as respects the mothers. It is, indeed, very difficult to suppose that a pregnant woman, who often has much greater appetite during than before her pregnancy, can be deprived for five or six months of three-fourths of her usual allowance, with impunity, besides being subjected to more or less frequent bleeding or purgation. Is it not to be feared lest debility, and the alteration of the solids and fluids resulting from such a course, so long continued, should predispose strongly to post-puerperal disorders, and even have an unfavorable effect upon her future health? I am well aware that nothing of the kind is mentioned in the cases referred to; but these are yet very few, and on that account no rule for the future.

In giving preference to any method, we should also take into account the suffering to which it subjects the patient. That occasioned by the induction of premature labor is almost nothing, and lasts but a short time. That such is not the case as regards the prolonged diet, even its partisans admit. In speaking of his first patient, M. Depaul says, we may conceive what she had to suffer, especially at the outset. For the *first two months*, he says, alluding to the second, she suffered much from epigastric pains, and a feeling of extreme hunger; her strength gave way, so as to make her unable to walk any considerable distance, or use any violent exercise.

All these sufferings would be readily endured, and, as M. Depaul remarks, the woman would derive, from the ardent desire of maternity which controls her, strength sufficient to brave everything, could we only assure her as to the result. But as most authors have regarded this method as very uncertain, as a large number of well-observed facts, though under other circumstances, tend to excite doubts as to its efficiency, and especially as, besides it, there is an operation which in no degree endangers the life and health of the mother, and saves the life of the children in nearly half of the cases, I acknowledge that, had I to decide for my wife or sister, I would prefer the latter.

Again, to what cases of contracted pelvis is this method particularly adapted? I have no doubt, says M. Depaul, that it would be entirely successful whenever the diameters were shortened to the extent of an inch and a quarter; but I would not venture to affirm it, if the antero-posterior diameter was only from two and three-quarters to three and a quarter inches in length.

It is, therefore, to such pelves as present diameters of at least from three and a quarter to three and a half inches in length, that M. Depaul restricts the use of the debilitating regimen. But, when placed on this ground, the question changes its aspect, and the results of the method are no longer comparable to those of premature delivery; for the latter operation is never practised but for contractions of a far more aggravated character. Accoucheurs are unanimous in considering the spontaneous delivery or extraction of a child as possible when the sacro-pubic diameter is at least three and a half inches in length. We have even seen that below this limit the expulsion of a living child is often possible; premature artificial delivery ought, therefore, to be preferred.

But if, alarmed by the recollection of antecedent deliveries of the same woman, you fear lest the child should have a large head like its predecessors, and conclude to interpose, do not subject a poor mother to the martyrdom of the prolonged regimen. Should the pelvis present three and a half, four, or four and a quarter inches, you might defer much longer the period at which premature delivery is effected; and instead of bringing on pains at seven months, or seven months and a half of gestation, you might wait for eight months, or even eight months and one or two weeks. The operation would then very probably afford a living child; for it is likely to support an independent existence in proportion as its intra-uterine life has been prolonged.

The mortality of the children, which has been justly objected to the induction of premature labor, diminishes greatly as we approach the term of gestation. By this operation, you spare the mother the long sufferings of the regimen, and probably afford equal security to the child.

Below from two and three-quarters to three and a quarter inches, there is nothing which shows any advantage in the plan of dieting, &c., over the induction of premature labor. But would the latter operation afford more favorable results if the mother were subjected to a severe regimen for a long time before practising it? It is enough to remember that the extreme weakness of children born before term is the usual cause of their death, in order to set aside a method the effect of which is to weaken them still further. I think, therefore, that in the present state of our science, new facts are required before adopting the dietetic regimen and bleedings. However, in order to enable the practitioner to judge this question for himself, I think it proper briefly to state the rules laid down by M. Depaul for carrying out the plan.

1. The greater the obstacle the more necessary is it to diminish the amount of food, and to bleed more frequently. Thus, when the pelvis is contracted by from *three-quarters of an inch* to an *inch and a quarter*, the method should be put *in full force*. (M. Depaul's first patient had her food regulated as follows: Soups formed its basis; vegetables once a day; meat once a week, and in very small quantity; half a pound of bread daily, including that in the soups. The first bleeding at three months, a second at six, a third at eight, and the last one at eight and a half months. Fourteen ounces of

blood to be taken at each time.) 2. It should be commenced toward the third or fourth month. 3. It would be well to diminish the amount of food progressively. 4. She should abstain from dark and very nutritious meats. 5. The bleeding must be regulated by the constitution and state of the circulation; it will be more useful in proportion as practised in the latter months.

It is hardly necessary to add, that if the obstacle were less considerable, it would be proper to act with less vigor, to begin the treatment later, and to increase the amount of food in proportion to the object to be attained.

For the same purpose, M. Delfraysse, of Cahors, recommends the administration of iodine during the last two months of gestation. Besides experiments made upon animals, the results of which seem favorable to his proposition, he mentions the cases of two women. One of them, whose pelvis was rather less than three and a quarter inches in extent, had been delivered three times, and very painfully, of dead children. In the two subsequent pregnancies, and during the last two months, she took, every morning, six, and afterwards eight drops, of the following mixture:—

Iodine, pure, ...	15 grs.
Iodide of potassium, ...	30 grs.
Distilled water, ...	f℥j.

She was delivered spontaneously of living children, one of them weighing twenty-two ounces and the other twenty-three less than their predecessors.

Experience can only decide the merits of this new method, which does not appear to have been injurious to the mothers.

PART VII.

OBSTETRICAL OPERATIONS.

THE indications arising from the various causes of dystocia just studied have been carefully pointed out, and each one, as seen, requires a different operation. This seventh part of the work is devoted to the operative procedures. The first chapter treats of the use of chloroform, which is an invaluable adjuvant in most obstetrical operations. In the second chapter is described the mode of applying the tampon, which, on the ground of utility, may be regarded as an important operation. Finally, we have to treat in the remaining chapters of the manipulations and operations, properly so called.

CHAPTER I.

ON THE USE OF ANÆSTHETICS IN OBSTETRICAL PRACTICE.

IN view of the wonderful results obtained by the use of ether in surgical practice, it was altogether natural to inquire whether so efficient a means of avoiding the pain of operations, might not be employed with advantage against the physiological pain which accompanies labor in the human species. But before speculating upon the probable advantages to be derived from its use in this way, prudence suggested the endeavor to foresee the disadvantages also. Might not the torpid condition of the voluntary muscles produced by etherization, extend to the muscles of organic life, and might not that action of the womb which is indispensable to a prosperous termination of labor, be paralyzed thereby? Supposing, even, that the uterus should preserve its contractile powers in the midst of the general paralysis, would not the want of that assistance which it receives from the voluntary contractions of the abdominal muscles, and of that synergic action which is so useful in the termination of labor, render the expulsion of the fœtus very difficult, or even impossible? Might not the health and even the life of the child be endangered by the vapor inhaled? And might not the latter, which has occasioned some serious accidents in surgical practice, prove an addition to the dangers which threaten the female during labor and the lying-in? The previous solution of all these questions is of the highest importance, and we may readily understand the effect they must have had in inspiring with prudence those who were the first to employ anæsthetics against the pains of childbirth. Some of these questions are capable of elucidation by the application of certain pathological facts; others could be solved only by experiment, and this experiment had yet to be performed.

Professor Simpson, of the University of Edinburgh, was the first to venture upon the administration of ether in labor. The opportunity presented on the 19th of January, 1847. The woman had a deformed pelvis, and having decided to turn, he thought the occasion a favorable one for determining the influence of inhalation of ether upon the contractions of the uterus; for, supposing the contractility of the organ to be paralyzed by the anæsthesia, the introduction of the hand and evolution of the fœtus would only be facilitated thereby. The result was so satisfactory as to convince Dr. Simpson that, notwithstanding the complete abolition of sensibility, the action of the womb might continue intact. Encouraged by the first trial, he repeated the experiment in several cases of natural and of difficult labor, and on the 10th of February communicated the results to the Obstetrical Society of Edinburgh.

Almost immediately after becoming acquainted with his observations, several English accoucheurs, Murphy (of London), Protheroe Smith, and Landsdown, administered ether with a like success. Fournier Deschamps was the first to use it in France, and that only eight days subsequent to the publication of Dr. Simpson's first observation. In the month of February, in the same year, Professor P. Dubois laid before the Academy of Medicine the result of its administration in six cases of labor under his own notice. In March, it was used by Stoltz, at Strasbourg, and by Delmas, at Montpellier. In August, I made, in connection with Mr. Smith, some experiments at the Clinique d'Accouchements, then under my charge, but the first trials did not seem to me encouraging. Still later, MM. Chailly, Colrat, Villeneuve, Roux, Male, and several others, published their observations. In Germany, Professor Martin (of Jena), and afterwards, Professors Siebold and Grenser (of Leipzig), used ether in several cases of natural and of difficult labor. Lastly, in America, Drs. Channing, Clark, Putnam, and others were the first to make known the results of their experiments.

In November, 1847, the substitution of chloroform for ether, as proposed by Dr. Simpson, gave a fresh impulse to the use of anæsthetics in obstetrics. The rapid action of the new preparation and its easy administration, were, perhaps, the occasion of a too ready forgetfulness of the dangers to which it might give rise, and were certainly the cause of its enthusiastic reception by at least a large number of English accoucheurs. At present, notwithstanding some opposition, chloroform is employed almost exclusively in obstetrical as well as in surgical practice.

Amongst the questions which would naturally present themselves to the mind of whoever first entertained the idea of using anæsthetics in labor, there are some, which, as we have said, receive a degree of light from known physiological and pathological facts. Of such are those having reference to the probable continuance of the uterine contractions, notwithstanding the complete torpor of the voluntary muscles, and to the more or less important assistance received from the abdominal muscles in labor.

Numerous facts at present authorize the belief that the momentary paralysis of sensation and voluntary motion does not sensibly interfere with the action of the womb.

Dr. Simpson was acquainted with those cases of complete paraplegia, in which delivery had been effected with its normal regularity and almost without pain; nor was he ignorant of the many instances in which women have given birth to children during the deep stupor of drunkenness; he had often seen labor terminated in patients affected with eclampsia, during the period of coma attending or following the convulsive paroxysms, without their being in the slightest degree conscious of what had occurred, as also the astonishment at their delivery manifested on the return of their senses. Nor are examples rare of the delivery of women, during a lethargy so profound as to be mistaken for death. It is distinctly proved by all these facts, that, notwithstanding the momentary or permanent extinction of volition, sensation, and voluntary motion, the organic contractility may not only continue, but be equal to the expulsion of the fœtus. Hence it was quite probable that the condition produced by the inhalation, resembling as it does in many respects the sleep of drunkenness or the coma of eclampsia, might, like the latter, have its influence restricted to sensation and to the muscles of animal life.

It was to be feared lest the anterior muscles of the abdomen should be paralyzed like those of the extremities, and that their inaction might somewhat retard the expulsive stage. But the happy delivery of paraplegic women, and of such as, notwithstanding a complete prolapsus of the uterus, have, unaided, been delivered of the product of conception, naturally presenting themselves to the mind, allowed of no hesitation on the score of even a probable paralysis of the abdominal muscles. Besides, in the case in which Dr. Simpson employed anæsthetics for the first time, version was to be performed, and he would be able to supply by tractions any deficiency of the expulsive powers.

More fortunate than Dr. Simpson, who at the time of his first experiments had only the rational inductions afforded by physiology and pathological anatomy to support him, we are now able to appeal to experience. Let us, then, with the assistance of the numerous facts now on record, endeavor to elucidate the various questions connected with the use of anæsthetics in obstetric practice.

1. *Of the Effects of Anæsthetics on the Uterine Contractions.*—On this point, as on many others, accoucheurs entertain various opinions. Some regard neither chloroform nor ether as possessing any power to suspend the uterine action; others think that the contractions are always retarded, and quite frequently even stopped entirely. Amidst these contradictory assertions and facts, it is, however, possible to discover the truth. A careful reading of all the observations will show that, with the exception of Paul Dubois, almost all authors are unanimous in the recognition of important changes impressed by the inhalation upon the contractions. These modifications are, besides, very various: thus, whilst M. Stoltz believed that he had observed an increase in frequency and intensity, and Mr. Murphy, whilst turning, declared that he had never before found the operation so difficult, although the patient was under the *full influence* of the agent, we find MM. Bovier, Siebold, Montgomery, &c., asserting that it retards and sometimes even completely suspends the labor. Dr. Denham also affirms, that in six cases in which chloroform had been administered before turning, the opera-

tion was rendered easier, and that its happy effect was especially evident in one case, where the introduction of the hand having been fruitlessly attempted before inhalation, it was effected very easily after it. We shall endeavor to account for this dissidence hereafter.

Whatever the exact truth may be, in an unprejudiced mind no doubt can exist of its being proved by numerous facts, that when chloroform is taken so moderately as to blunt and almost extinguish sensibility without entirely depriving the patient of the power of motion or of self-consciousness, it has, ordinarily, no influence over the contractile power of the uterus; but that when carried to complete anæsthesia, the contractions may be diminished both in frequency and intensity to the point of complete extinction. The latter fact is acknowledged by Dr. Simpson himself, and he regards it as of possible occurrence in some cases of moderate anæsthesia. The degree of the latter, he remarks, which some patients are able to bear without the womb being affected, is exceedingly variable. Some are thrown into a profound slumber without interference with the uterine action. Others, on the contrary, experience interruption of the contractions by a much slighter degree of anæsthesia. These individual predispositions explain Mr. Montgomery's observations of the manifest diminution of the uterine contractions under the sedative influence of chloroform without the woman being insensible to pain. Besides, according to the majority of English practitioners, the retardation or the suspension of labor is the indication *for the particular case*, that the dose of the agent which the patient might have supported without inconvenience has been exceeded, and the best means, according to Dr. Simpson, of restoring energy to the uterus, is to cease the inhalations for some moments and then resume them in more moderate proportions, as soon as the patient shall evince sensibility. It is stated by the Edinburgh accoucheur, that the return of the contractions on withholding the chloroform is delayed but a few minutes only; such, also, is the view of Denham, Murphy, and others. Mr. Montgomery, however, has less confidence in this prompt return of the contractions. In a very recent case he witnessed an interruption of the labor by so feeble a dose of the chloroform, that the patient was all the while expressing with volubility the delicious sensations she experienced; and notwithstanding the suspension of inhalation, the uterus remained inert for some hours before resuming its original activity. I have seen, says the Dublin professor, several similar cases.

1. To recapitulate: In the majority of instances, the contractions are unaffected by the inhalation of chloroform. 2. When the anæsthesia is pushed too far, the labor is often suspended. 3. In certain individuals, the same result may be produced by moderate doses of the agent, and that before the loss of sensibility and consciousness.

This difference in the results, setting aside certain altogether exceptional and as yet inexplicable idiosyncrasies, is manifestly due to the extent and duration of the etherization. The various facts, says M. Bouisson, which have served as a basis to so many different opinions, are but the simple expression of greater or less degrees of anæsthesia, and the phenomena presented by the uterus in regard to sensibility and contractility, are themselves included in the general laws of anæsthesia. We are, in fact, perfectly well aware, that the participation of the organic movements in the depression which the inhalations produce in all the powers of the economy, is to be reckoned amongst the ultimate phenomena of etherization.

2. *Influence of Anæsthetics upon the Contraction of the Abdominal Muscles.* It is well known that in the last stage of labor the womb seems to call to its aid the action of the voluntary muscles, and that the efforts of the female assist in overcoming the obstacles to the passage of the fœtus. It would appear as though, being dependent upon the animal life, the action of those muscles which accomplish the effort would be destroyed by the ether or chloroform, as is that of the muscles of the extremities. Now, according to the majority of accoucheurs, such is not usually the case, but that unless the anæsthesia be carried farther than prudence would dictate, the auxiliary power of the abdominal muscles is not wanting to the uterine contraction. My friend M. Longet thus attempts to explain this singular phenomena. He first calls attention to the fact, that in the midst of the complete collapse, the respiratory movements are still accomplished. Now the effort in general, and that which accompanies labor in particular, are but a modification, a transitory change in the respiratory act; it is a state requiring an energetic contraction of the muscles of the chest, diaphragm, and abdominal parietes. Since in etherization the respiration is maintained in all its integrity, volition being absent, and the medulla oblongata continues to excite all the muscles that concur in its accomplishment, the effort which is the result of the action of these muscles, those of the abdomen included, should also continue to be produced. I would also willingly add, with M. Bouisson, that since it is at the present day demonstrated that the reflex or excito-motor power of the spinal marrow, which produces movements without the participation of the will, is not abolished by etherization except when carried to an extreme degree, the part which is played by the abdominal muscles in parturition may properly be regarded as reflex in its nature. Their manifest relation with the viscera of the lower part of the abdomen leads, naturally, to the supposition that the excitement emanating from the uterus during the act, is directly reflected by the spinal marrow upon the muscular planes of the abdomen. What tends to prove it is the fact that the abdominal muscles may refuse the contingent of force which they contribute to this act, provided the etherization be carried so far as to abolish the reflex power, whilst they continue to act, though more feebly, it is true, as muscles of respiration (Bouisson). I was, on one occasion, enabled to verify the correctness of this observation of the Montpellier professor.

3. *Influence of Anæsthetics on the Resistance of the Perineum.*—One of the advantages usually attributed to the use of ether or chloroform is such a diminished resistance of the perineum as to facilitate the expulsion of the fœtus, and to prevent almost certainly the ruptures which it so often suffers in labor. Were I to rely only upon my personal experience, I should find it difficult to arrive at a definite conclusion, particularly as I have witnessed very different results. Thus, like Messrs. Dubois, Chailly, and others, I have sometimes known the perineum yield and distend with great facility; though more commonly, even when the anæsthesia was complete, it remained as resistant as ever, and even, as in the case reported by M. Villeneuve

(of Marseilles), in three instances, to be ruptured very badly.[1] On a still more recent occasion, M. Danyau and myself were obliged to incise each side of the vulvar orifice very deeply, the patient being completely under the influence of chloroform. I am unable to say why these differences should exist, because the anæsthesia was perfect in all the cases just mentioned; so that different degrees of this condition cannot be alleged in explanation. Perhaps it will be well to remember how very variable is the resistance offered by the perineum in different individuals, and how very difficult it is to foresee what will occur in any particular case. Every day's practice shows how liable our predictions are to be falsified by the event.

Again, supposing that under the influence of the pressure which these muscles have to sustain, the reflex action of the spinal marrow is unable to produce their contraction in the efforts, involuntary though they be; supposing, we repeat, that they are paralyzed in the etherized female, it is not to be credited that the entire resistance of the perineum is on that account ever suspended. The fact is, that the resistance is ordinarily due quite as much to the aponeurotic planes of the pelvic floor, and to the sometimes very large amount of fatty tissue situated between the different layers, as to the muscular fibres themselves. In those who have borne children, and in whom the perineum presents but slight resistance, the muscles of this region are at least quite as fully developed and as strong as in primiparous females. To what, then, can be due the facility with which the fœtus is expelled, if not to the greater elasticity of the aponeurotic planes, which, having suffered distention in previous labors, have their suppleness increased thereby? Since the chloroform can have no effect upon them, it is no cause for astonishment that after its administration the resistance of the perineum should continue.

Hence we may conclude that: 1. When properly administered and in moderate doses, anæsthetic agents do not interfere with the regular course of the uterine contractions; and that whenever their administration is followed by the cessation or weakening of the efforts, the effect ought not to be attributed to the agent, but to the abuse which has been made of it. 2. That it is not yet sufficiently shown that during the anæsthetic slumber, the abdominal muscles continue to aid, by their contraction, the expulsive efforts of the womb. 3. That fresh observations are necessary to settle definitely the influence of chloroform upon the resistance of the perineum.

Before determining what cases indicate or contraindicate the use of chloroform, it remains for us to state what is proved by experience regarding the influence of chloroform upon the health of both mother and child.

1. *Effect upon the mother's health.*—Accoucheurs who have often used chloroform, are almost unanimous in the declaration that it has never had the least mischievous effect upon the mother's health, whilst in all cases it

---

[1] Rupture of the perineum does not prove, however, that the resistance may not have been lessened by the use of chloroform. In two cases, indeed, it seemed to me that the great rapidity with which the distention and thinning took place facilitated the rupture. This stretching, resembling precisely what a piece of India rubber would undergo, was effected so quickly by the very strong pains, that there occurred, first, a sort of fraying, followed by extensive rupture of the perineum.

has spared them the sufferings of the last expulsive pains. None of my patients, says Dr. Simpson, have been conscious of them; and several, through their confidence in etherization, have been spared the fears which they usually suffered toward the end of their preceding pregnancies, in anticipation of the coming labor. By exempting women from the terminal sufferings, the anæsthesia husbands their strength, and avoids the nervous exhaustion which follows a painful labor. Some, who were already mothers, declared in grateful terms their condition to be incomparably better than after their previous labors. Their recovery, continues the same author, is more rapid, and consecutive inflammations are much rarer or less serious than usual.

I am not yet convinced, so far at least as regards natural labor, that this last proposition is fairly demonstrated; and nothing in the facts yet known, those even of Dr. Simpson included, appear to me of a character to prove its exactness. In natural labor the fatigue is moderate, and the remembrance of it soon abolished by the happiness of maternity. The lying-in demands always the same precautions, whether chloroform be used or not, and the time of getting up is nearly always the same. Finally, in an epidemic of puerperal fever at Edinburgh, the women who had used inhalations were not more exempt from the disease than those who had not.

I would even add, that in tedious labors the gravity of consecutive accidents has not been sensibly diminished by the use of chloroform. Its only incontestable effect is to abolish pain, and prevent the considerable nervous disturbance sometimes consequent thereto. This result is, doubtless, of importance, but, except in some very exceptional cases, the pain is not fatal of itself, and the nervous shock is generally avoided. Metritis, deep-seated suppurations, inflammations, and gangrenous eschars of the soft parts of the pelvis, are consequences of the violent uterine efforts. Now, as Montgomery has shown, the only effect of chloroform is to remove the pain, leaving intact all the other consequences of difficult labors.

Another incontestable advantage of chloroform is that of facilitating certain obstetrical operations. The uncontrollable and disordered movements of the agonized female hinder the operator greatly; but the sleep which she enjoys during the inhalation, and the complete insensibility of all the organs, enable her quietly to bear the most painful operations.

The annihilation of pain in all cases, the prevention of the nervous shock which is sometimes the consequence of too painful or too prolonged a labor, and the facilitation of obstetrical manœuvres, are, therefore, the only indisputable advantages to be derived from the use of chloroform.

Are not these advantages counterbalanced by serious inconveniences? Such is the opinion of some accoucheurs, though they have, in my opinion, exaggerated both their frequency and gravity. We are now able to estimate its power of suppressing the pains of labor: prudently administered, it in no respect alters the regularity and power of the contractions; but is it altogether the same as regards the contractility of the tissue, and may not the retraction of the womb after labor be in some degree modified by the previous use of anæsthetics? I confess the want of an entire assurance upon this point, and am inclined to believe that they have not, in some cases at least, been altogether without influence in the production of subsequent inertia and hemorrhage. Two cases of slight hemorrhage are quoted by Duncan, one of which, it is true, occurring in a twin labor with extreme distention of the uterus, is thereby sufficiently accounted for; but the other took place six hours after delivery, without any appreciable cause. Dr. Channing has met with 4 cases of hemorrhage in 78 of anæsthesia. In one case it was internal, and happened one hour after delivery; in another, the woman half fainted immediately upon the termination of labor, and he found the uterus much enlarged and filled with clots, upon the removal of which, the organ contracted, and there was no further loss. In a third case, a serious hemorrhage occurred immediately after delivery. The fourth observation is less conclusive, on account of the patient having experienced losses after previous labors, and because the delivery of the placenta was made difficult by adhesion. Dr. Montgomery declares, as his personal experience, that when the influence of the chloroform is kept up until the labor is ended, the patient is more or less exposed to hemorrhage from inertia and to retention of the placenta. The experience of several of my brother practitioners, he adds, has been similar to my own.

I am well aware that in all these instances the hemorrhage may have been due to various circumstances, and there is nothing to show that chloroform was necessarily the cause; still, it is well to be aware of them, were it only to excite prudence in the use of the agent; for, since by too large a dose the exercise of the organic contractility has sometimes been suspended, why may not the same dose diminish the contractility of the tissue? In practice, these facts ought not to be lost sight of, and I think that, immediately after delivery, it would be prudent to administer some ergot.

In certain surgical operations, death has resulted immediately from the administration of chloroform. Is not the supposition both probable and reasonable, says Dr. Montgomery, that a similar misfortune might happen to a woman in labor? Doubtless it is possible; but happily, although a great number of women have used inhalation, not a case can be mentioned in which sudden death can be reasonably attributed thereto; for I cannot accept as such the following related by Gream. A young woman had just been delivered of one child, and chloroform was administered before the expulsion of the second; death ensued in half an hour. No further detail is given. In two other cases mentioned by the same author, death occurred at a still later period after delivery. The patients whom the surgeons have had the misfortune to lose, did not die in this manner; for, in their cases, it was during the administration of the agent that life became extinct; it is, therefore, because in the observations of Gream a longer or shorter time had elapsed between the cessation of inhalation and death, that I cannot regard the chloroform as chargeable with the fatal result.

With still less reason has it been reproached with the production of eclampsia, by increasing the cerebral congestion, which the exertions of labor have of themselves a tendency to produce. For, although Wood has quoted a case of convulsions occurring in an etherized woman in the last stage of labor, we are now in possession of enough facts to prove that the administration of chloroform during convulsive attacks, lessens their frequency, and sometimes puts an end to them altogether.

Inhalation has also been accused of the production of insanity; of which, says Channing, there is not a single well-established case. In reference to this point, he cites the following observation by one of his countrymen. An insane woman had in a preceding labor suffered from extreme agitation, which was the occasion of serious difficulty. In her last labor, ether was administered, thanks to which, the patient was perfectly quiet, and all passed over admirably.

2. *Effect of Chloroform upon the Life and Health of the Fœtus.*—Whatever difference of opinion may still remain respecting the influence of chloroform upon the health of the mother, no one doubts its entire innocence as regards the fœtus. In the immense majority of cases, the new-born child presents its usual appearance; its cries are neither weaker, nor heard less promptly, nor does its viability appear to be in any way injured. Thus have the gloomy previsions of certain physiologists been falsified by experience. The conclusions which M. Amussat thought himself entitled to draw from his experiments were contradicted by the ulterior researches of M. Renault.

Indications.—In what cases is the accoucheur justified in the employment of chloroform? This question is variously answered in different countries. Dr. Simpson, and with him quite a large number of his countrymen, recommend it unhesitatingly in all labors, whether natural or difficult. In France, on the contrary, it is confined almost exclusively to cases of difficult parturition. We adopt unhesitatingly the latter position, and a few words will suffice to explain the motives of our preference.

Whilst regarding the use of chloroform as devoid of danger in the majority of cases, we cannot entirely forget the misfortunes of certain surgeons, who had, nevertheless, taken the best precautions to avoid them. Now, though it be allowable to subject a patient to some danger, in order to spare him the intense suffering of an amputation or any other bloody operation, are we sufficiently authorized to do so when the regular accomplishment of a function is concerned? And, after all, is the suffering of child-birth, in simple cases, so grave and terrible? Do we not see women delivered almost without pain? To speak only of what is most common, do they not often preserve their calmness and gayety to the end of the labor? Do they not often complain of the repose afforded by the intervals between the pains, and ardently desire their return, in the conviction that each is a step toward delivery? Why, therefore, with the simple object of sparing them some suffering, which, after all, they endure courageously, deprive them of the caresses of the husband, the condolence of their relatives, and deaden the imagination, already teeming with the joys of maternity? Why, especially, should they be deprived of the ineffable happiness of hearing the first cry of the new-born child? Instead of the pleasant chatting in which women so often indulge, instead of those maternal aspirations and dreams of the future which soothe the young mother, what do we observe after the anæsthetic inhalations? A deep sleep, resembling more or less the coma of inebriation, or concussion of the brain, a complete annihilation of the sensorial and intellectual faculties, is the lot of the mother; an always increasing solicitude that of her attendants. Finally, we may add, that, supposing the physician to be devoid of all fear, he is obliged to remain constantly by the side of his patient to administer the agent personally, and to watch attentively the state of the pulse, of the breathing, and of the heart.

As a justification of the use of anæsthetics in ordinary labors, it has been said that they favor the dilatation of the mouth of the womb, and by lessening the resistance of the perineum also shorten the period of expulsion. We have already seen that the diminution of the resistance of the perineum is not sufficiently proved; and the same may be said, I believe, of the rapidity with which the dilatation of the orifice is effected. However it may be, upon consulting the published observations, it is not discoverable that, in the cases in which chloroform has been employed, the duration of the labors, as compared with preceding ones, has been sensibly shortened.

Besides, the duration of a labor becomes dangerous for either mother or child only as it exceeds the natural limits, and of the latter case only are we speaking at present.

The case is different when some unfortunate complication disturbs or interferes with the course of nature. It will have been seen, on reading this work, that we very often have spoken in favor of the use of chloroform, and we shall now proceed to recapitulate the different cases in which we feel justified in recommending it.

It may be especially useful: 1. In calming the extreme agitation and mental excitement which labor often produces in very nervous women. 2. In those cases in which labor appears to be suspended or much retarded by the pain occasioned by previous disease, or such as may supervene during labor (vomiting, cramps, colic, compression of the sciatic nerve). Dr. Montgomery, who certainly is no enthusiast, states that he had witnessed a case, in which he certainly would have used chloroform had he been acquainted with it at the time: the sphincter ani muscle was affected with so violent a spasmodic pain as almost to deprive the patient of reason. 3. It seems to us particularly indicated by those irregular or partial contractions, which, notwithstanding the intense and almost constant pain which they occasion, have no effect to advance the labor. We might even think, with M. Bèle, that chloroform, which must be exhibited in very large doses to suspend the normal and rhythmical contractions of the uterus, would act much more promptly in stopping the irregular contractions. 4. Spasmodic contraction and rigidity of the cervix uteri have sometimes been favorably affected by inhalation. As this part of the uterus receives some spinal nerves, it becomes, to a certain extent, a portion of the muscular apparatus of animal life. Facts are, however, as yet too few to enable us to determine the question.

When the last edition of this work was published, I was not sufficiently informed in respect to the usefulness of anæsthetics in their treatment of eclampsia. Besides, having had no personal experience, the cases I had read of, those quoted so abundantly by Channing included, still left me in doubt as to their utility. This being the case, I came to no definite conclusion, leaving the question for decision in the future. Since then, the publication of further observations, as well as my own experience, lead me to advise the use of chloroform. It has seemed to me especially useful when the convulsions begin during pregnancy, or at an early period of labor, when blood-letting, purgation, revulsives to the skin, &c., have all been tried and the attacks continue as severe as ever. The same remark applies to their occurrence only after delivery, or when, having begun during labor, they persist after the child is born. Under the latter circumstances, however, I think it important not to stop the inhalations too soon after the attacks have ceased. At any rate, it were prudent to stand prepared to recommence them should the convulsions be renewed.

Obstetrical Operations.—Not only does chloroform abolish the great pain produced by various obstetrical operations and relieve the patient from the dread which they inspire, but by rendering her motionless, greatly facilitate the manœuvre. It is, therefore, no despicable auxiliary, provided the nature of the services required of it be well understood. Turning, for example, would certainly be facilitated by the immobility and insensibility of the patient, but not at all by any fancied suspension of the physiological contractions; only the sensibility and irritability of the organ being destroyed, it is not irritated by the presence of the hand, and the usual spasmodic contraction does not occur. To expect other assistance from the chloroform, to propose, for example, overcoming by its aid the difficulties sometimes presented by a long and strongly contracted uterus, would be asking of it more than it can yield.

If ever symphyseotomy or the Cæsarean operation be decided upon, I should think the administration of chloroform as likely to be useful as in any other great surgical operation. Finally, the difficulties attendant upon the delivery of the placenta from its abnormal adhesions, and from irregular contraction of the uterus, sometimes require proceedings which are very painful to the female. Anæsthetics may here render the same services as in version. It is, however, necessary not to administer them too freely, for, independently of the dangers of which we have spoken, it might be feared lest by paralyzing the contractile powers of the womb, they should expose the patient to inertia and consecutive hemorrhage.

Before finishing the study of the indications for the use of chloroform, we add a few remarks on its administration to pregnant women and nurses.

During Pregnancy.—Is the somewhat free use of anæsthetics during pregnancy capable of exciting premature contraction of the womb, or of exerting any deleterious influence upon the health or life of the child? In reference to this question, M. Blot mentions in his thesis three cases, two of which came from M. Chassaignac: In the first case the woman had, *three days after* the inhalation, uterine and lumbar pains which yielded readily to opiates; the pregnancy, however, pursuing its regular course. Another patient, five months advanced, presented nothing unusual. The third observation, borrowed from Robinson, had reference to a young woman who, in the fifth month of her third pregnancy, breathed chloroform for the relief of toothache, remaining in a state of demi-stupor for half an hour. Shortly after, abdominal pains came on, which increased, and in a few days ended in abortion. This last case is the only one to which I attribute some importance, and if it should recur in other instances, would show the importance of great caution in the use of inhalations during pregnancy.

Whilst Nursing.—M. Blot also mentions in his thesis two facts tending to prove that the chloroform inhaled may pass into the secretions, and that occurring in a nurse, for example, might have a bad effect upon the child if sufficient time were not allowed to elapse between the period of inhalation and that of suckling. A mother put her child to the breast three hours after breathing chloroform, and in a few moments it fell into a profound sleep, which lasted for eight hours. After the sleep, came on a state of excitement which continued for two days (Scanzoni). An analogous case is reported by M. Chassaignac. It would seem prudent, therefore, to delay nursing in such cases for seven, eight, or ten hours.

Mode of Administration.—The plan described by Dr. Simpson is the one usually followed. It consists, as is well known, in placing near the nostrils and mouth a concave sponge, or a handkerchief folded into a cone, after having poured into the concavity a drachm or two of chloroform. The handkerchief ought to be held rather above the opening of the nostrils, for the weight of the chloroform being rather greater than that of the air, it would otherwise fall, and not enter the mouth or the nostrils. The sponge should be held at some distance from the face, so as to allow a free passage to air, and prevent contact of the fluid with the skin and mucous membrane. If this precaution be not taken, little vesicles, and even small superficial eschars, will be formed. During the interval of the inhalations, the evaporation of the chloroform is prevented by closing the hollow of the handkerchief by the corners or with the hand.

Dr. Simpson recommends beginning with a strong inhalation, and at the outset, to cause enough to be breathed to produce complete somnolence. He attributes the loquacity, delirium, spasms, and extreme agitation observed in certain subjects, to beginning with too small a dose. This advice, which is very proper if ether be employed, is not of equal value if chloroform be used. The latter generally produces much less excitement, and throws the patient at once into a tranquil sleep. The cough and pulmonary irritation which they sometimes occasion depend either upon the bad quality of the agent or the holding of the sponge too near the nostrils at the outset, thus causing too much of the vapor to be respired at a time.

When an operation to last but a few minutes is to be performed, it is proper, as in surgical practice, to induce profound slumber, and to continue inhalation whilst the operation is going on. But if it be intended merely to moderate the general excitability of the female, to abolish a pain which is foreign to the labor, or to modify partial, irregular, or tetanic contractions, it is necessary, after quietness is obtained, to remove the sponge in order to allow of free respiration, and to be content with a few slight inhalations at the beginning of every contraction. Three or four pains may sometimes be allowed to pass without applying the sponge, having recourse to it only when the patient complains of suffering. These repeated inhalations are sufficient to keep the patient in a state in which self-consciousness is lost, and which may thus be prolonged for several hours without inconvenience. What we have to avoid, adds Dr. Simpson, is either too much or too little.

By too large a dose, the contractions may be suspended; by too small a one, much excitement is produced. To calm the latter, increase the dose; to remedy the suspension of the pains, withhold the chloroform for some time.

It is a singular fact, that large inhalations are less likely to suspend the contractions in the second than in the first stage of labor, and, consequently, there is then less inconvenience in administering them to a smaller extent. Let it not be imagined, however, that in order to produce complete anæsthesia, it is necessary to carry the inhalations so far as to produce noisy respiration, as in surgical practice. It is rarely needful to go so far. The amounts required to produce sleep and immobility also vary greatly in different individuals.

The patients are calm during the intervals between the pains; at the return of the contractions they indicate to the accoucheur by more or less motion, and by slight groaning, that sensation is not completely abolished, and that it is proper to repeat the inhalation.

So long as the etherization is continued, the greatest silence should be maintained about the bed of the patient, for the general excitement and loquacity produced by the first doses are sometimes augmented by noise.

CHAPTER II.

THE TAMPON.

[The tampon is a sort of plug inserted in the vagina for the purpose of arresting a flow of blood. From its simplicity, it might be regarded as a sort of dressing, whilst its importance justifies its being classed with the operations proper, and may be compared with the plugging of the nasal fossæ.

In several passages of the present work, especially on pages 584, 778, 785, and 907, we have described at length the cases in which it should be resorted to, and it now remains to describe the way of applying it.

Leroux (of Dijon), has the credit of introducing the tampon into practice (1776). His plan was, to fill the vagina with linen or tow, previously saturated with vinegar, which liquid, he thought, would cause the blood to coagulate more quickly and perfectly. The application is now generally made as follows: enough charpie to fill a common wash-basin is provided, the quantity, although apparently large, being really hardly sufficient, on account of the loss of bulk by compression and the great distensibility of the vagina. The charpie is formed into pellets moderately compressed, and each tied to the end of a strong thread for the purpose of withdrawing it readily when it is thought proper to remove it.

When charpie is not at hand, tow or cotton may be substituted. As time is always consumed in the preparation of a tampon, everything should be made ready beforehand as soon as there is reason to suppose that a serious hemorrhage is likely to occur.

To apply it, the patient is placed across the bed with the seat at the edge of the mattress and the limbs held apart by assistants. The pellets are then to be introduced successively into the vagina. The first ones being applied directly to the neck of the womb, where they are held whilst the culs-de-sac are filled compactly with others. The vagina is thus to be filled throughout its whole extent, taking care that no space is left unoccupied, for the plugging will not be well done unless the canal be filled to distention with the compressed material. Thick wads of the substance used, are then to be applied to the vulva in order to support and retain the pellet, and the whole to be kept *in situ* by compresses and a T-bandage drawn tightly.

I dwell purposely on these details, because a well-applied tampon is an heroic measure in the treatment of certain hemorrhages; but if badly or imperfectly managed, it does not prevent the effusion of blood and occasions the loss of time. The pellets may be introduced into the vagina in two different ways: sometimes by means of a speculum, to the bottom of which the charpie is carried, whilst at others, and, as we think, preferably, two fingers are introduced and the pellets slipped in upon them.

The advice of Leroux, to saturate the charpie with vinegar, is now generally disregarded, the pellets being lightly greased with cerate which facilitates their introduction and makes them less permeable to blood. In case of insertion of the placenta upon the neck of the womb it might be of advantage to saturate the first pellets in a solution of perchloride of iron. The use of the latter preparation is not unobjectionable and will rarely be necessary when the tampon is carefully applied.

The effect of the tampon is to arrest the blood, which then coagulates progressively up to the orifices of the ruptured utero-placental vessels and thus soon checks the hemorrhage. It has also another effect: it irritates the neck of the womb and causes the organ to contract, which may, on the one hand, assist in arresting the blood, and on the other, conduce to the expulsion of the ovum. This would be an advantage toward the end of pregnancy, but a serious inconvenience in the earlier months. On this account, the tampon is more especially indicated when the fœtus is viable, and ought not to be used before then unless depletion of the womb seems necessary to save the life of the woman.

The presence of the tampon occasions more or less discomfort. Some women can bear it for several days, whilst to others it becomes intolerable after a few hours. These individual differences must be taken into account when it becomes a question as to the time for its removal. Still another effect of its application, may be retention of urine caused by pressure upon the urethra. This must be relieved twice or thrice in the twenty-four hours by the use of the catheter, which requires, however, that the pellets nearest the vulva should first be removed, though they must be replaced when the operation is completed.

As a general rule, the tampon may be allowed to remain for twenty-four hours at least. Then it ought to be removed for the purpose of ascertaining the effect produced upon the neck of the uterus; and the opportunity may be taken to wash out the vagina by means of an injection. Another tampon, prepared beforehand, should replace the first one if deemed necessary. When labor has begun, the removal should be made rather oftener in order to watch its progress. It sometimes happens that the plug is forced out by the descending head of the child, in spite of the retaining bandage. It is evident that when the expulsive stage begins, the presence of the tampon will be more injurious than useful.

In most cases, it were better to allow the tampon to remain too long, than to withdraw it prematurely. Its removal is effected by drawing successively upon the threads attached to the pellets, beginning with the last inserted. It is very readily done, the only difficulty arising from the commingling of the threads, which often makes several trials necessary. To remedy this slight inconvenience, it was proposed to make the tampon like the tail of a kite, attaching all the pellets to the same thread at intervals. When so constructed, it would certainly be more readily withdrawn, but as it cannot be applied with the same facility, we prefer the common method.

In conclusion, I repeat that a well-applied tampon rarely fails to accomplish its object, but very often the operation is badly performed. To do it properly often requires considerable time, and the necessary material is not always at hand, in which case something else must be substituted. Chailly used for the purpose a gum-elastic bladder which he passed into the vagina and then inflated so as to fill and distend the canal. The bladder, however, on account of its rounded form, adapts itself less perfectly to the inequalities of the os tincæ and of the two culs-de-sac of the vagina; its polished surface, also, is less favorable to the stoppage and coagulation of the blood than are the masses of charpie. To meet this defect, the English encase the bladder with a covering made of sponge, — which, however useful, is not absolutely necessary. The advantage of the apparatus consists in its ready application, whilst its management is so simple that it can be explained and put in charge of an attendant at the bedside of a patient threatened with hemorrhage. On these accounts, we are unwilling to reject it, but recommend that in making a selection, preference be given to a globe with very supple walls, which should be made distensible by rubbing in the hands and successive inflations in order to enable it to conform better to the shape of the vagina. Finally, we prefer the injection of water to inflation, because the air is too susceptible of compression. Notwithstanding all these precautions, it should be understood that we still prefer plugging by means of charpie, though recognizing the great advantage of the gum-elastic globe as a temporary tampon.]

CHAPTER III.

OF VERSION.

VERSION is an operation by which one of the two extremities of the child is brought to the superior strait: it therefore exhibits two varieties, in one of which the operator proposes to bring down the feet, and hence this is called *pelvic* or *podalic* version; while in the other he attempts to deliver by the head, which is on that account denominated *cephalic* version.

Cephalic version was almost exclusively practised from the time of Hippocrates until that of Ambrose Paré, that is to say, down to the latter half of the sixteenth century. Celsus advised that when the child is dead, and the head cannot be reached without too great difficulty, the feet should be sought after. Ætius and Paulus Ægineta were the first among the ancients to recommend pelvic version when the child is living. But since the days of Paré, or rather since those of Guillemeau, his pupil, the pelvic version has been recommended as applicable to all cases; and the cephalic reduction was almost entirely forgotten, until toward the end of the last century, when Flamand, and, somewhat later, Osiander, exaggerating, doubtless, the inconveniences, difficulties, and disastrous consequences resulting from the pelvic version, proposed a return to the precepts of Hippocrates; and suggested the cephalic one in almost all cases where the hand alone is sufficient to terminate the labor. The doctrine of the Strasbourg professor was favorably received in Germany, but was too severely criticised by the school of Paris. Indeed, Baudelocque scarcely speaks of it, and Gardien restricts its application to a very limited number of cases, while Madame Lachapelle formally rejects it. But we shall see hereafter, when studying the respective value of these two operations, that at the present day it would be improper to embrace either opinion exclusively; for some cases are better suited to the cephalic version, while there are others, on the contrary, where the pelvic one is alone practicable; consequently, both operations should be retained in practice, leaving to the judgment of the accoucheur to determine the cases in which the one or the other ought to be preferred.

Both operations may be performed shortly before labor, during labor before the membranes are ruptured, or during labor but not until after the membranes are ruptured. In the latter case they almost always require the hand to be passed into the womb, whilst in the former this is very rarely necessary, inasmuch as the presentation can be changed by placing the woman in a suitable position, and applying pressure through the abdominal walls. This constitutes version by external manipulation.

ARTICLE I.

VERSION BY EXTERNAL MANIPULATION.

Version by external manipulation was vaguely referred to by Hippocrates, and more distinctly advised by Jacob Rueff and Mercurius Scipio, yet it passed into oblivion until the commencement of the present century (1812), when Wigand addressed to the Academies of Berlin and Paris, a memoir comprising a complete history of the operation. Wigand's paper was probably lost in France, since it is mentioned in none of our classical works, and we remained ignorant of the wise counsels of the German accoucheur. I ought, however, to add, that, in opposition to the views of Baudelocque, Madame Lachapelle, Capuron, and others, M. Velpeau had indicated (1835) the propriety of performing cephalic version in some cases by means of external manipulation. M. Lécorché-Colombe, also (1836), both advised, and several times executed this operation at the Clinique, and I myself, in previous editions of this work, discussed more clearly than my countrymen, the cases in which it seemed to me that it might be performed with advantage.[1]

It should, however, be said that no one amongst us had treated the question as fully as M. Mattei, who, although exaggerating the advantages of the operation, and needlessly multiplying the indications for it, had at least the merit of again calling attention to a too much neglected subject. Indeed, we probably owe to the exaggerations of our countrymen, the ability to read in French, the excellent translation made by MM. Belin and Hergot of Wigand's paper. Two pupils of the Paris school, Drs. Ducellier and Nivert, have, since then, made this subject their study in their inaugural thesis; so that, in consequence of all these labors and of the clinical instructions of Professor Stoltz, the teachings of the Hamburg professor are now well known. Thanks to this translation, as well as to the clinical teaching of Professor Stoltz, the doctrines of the Hamburg professor will soon be popular in France.

---

[1] I am, therefore, astonished to read in M. Belin's translation, that M. Cazeaux, in his edition of 1853, leaves us ignorant of both when and how the operation ought to be performed, and that I had been content with saying, in reference to cephalic version, that external manipulation, wisely conducted, had quite frequently been successful in changing the position of the trunk,—this, too, when no less than five pages of my book are devoted to discussing the indications of the operation.

External manipulation, performed with the object of bringing to the superior strait one of the fœtal extremities originally more or less remote from it, has been advised:

1. Before labor;
2. During labor and before rupture of the membranes;
3. During labor and after rupture of the membranes.

A. *Before Labor.*—Some accoucheurs have advised that external manipulation be resorted to in the last fortnight of pregnancy, and we have ourselves done so after the example of M. Lécorché-Colombe. M. Mattei, however, advises, of late years, that the version be performed from the sixth or seventh month. We think this can readily be done in most cases, at least where the presentations are transverse or oblique, though we believe that generally the operation will prove useless. When, in fact, the longitudinal axis of the fœtus is replaced in the axis of the superior strait, the form of the uterus, which, as shown by M. Hergott, is very probably the cause of the faulty position of the child, remains unchanged, so that the latter will gradually resume its primitive position; after a few days the extremity, which has been brought to the superior strait, no longer being found there. I have seen this happen several times. Therefore, as the bandages devised for compressing the sides of the abdomen with the view of lessening its transverse diameter and retaining the fœtus in the position given it, would be insupportable for two months, I agree with Wigand, that it is better to await the commencement of labor. Still, I would not say that it were useless to examine carefully all women during the latter months of gestation, in order to determine the form and obliquities of the womb, the position of the fœtus, the greater or less amount of fluid, and whatever other circumstances might affect the presentation of the child at the commencement of labor. When carefully performed, this examination will rarely lead to an immediate operation, but will often have the effect to awaken the attention of the accoucheur to difficulties which, at a later period, he may be able to correct in time.

Especially ought such an examination to be made when a faulty presentation had been discovered in preceding pregnancies, for were this found to be again the case, the woman would be advised to avoid all shocks or great fatigue, which might lead to premature rupture of the membranes. She ought to be strongly advised to observe the utmost quiet from the appearance of the first pain, and to call her physician as soon as possible.

In case of considerable anteversion, the uterus should be kept raised during the day by a broad belt around the abdomen supported by suspenders, whilst, at night, she ought to lie upon the back. When there is lateral obliquity, the decubitus should be upon the opposite side. We have nothing further to say in regard to version before labor.

B. *During Labor and before Rupture of the Membranes.*—Under these circumstances is it, that version, by external manipulation, has been especially lauded by Wigand and German writers, and then only is it that it seems to us to possess incontrovertible advantages. We may readily conceive, that the mobility of the fœtus at that time, immersed as it is in the amniotic fluid, ought strikingly to facilitate the movements sought to be executed; whilst, on the other hand, the possibility of rupturing the membranes as soon as the operation has succeeded, affords a sure means of avoiding a relapse.

With the exception of some special cases, of which we shall have to speak hereafter, it seems to us indispensable, as a general thing, that the membranes should remain entire. A second condition regarded by Wigand as very important, is the persistence and regularity of the uterine contractions. If too feeble, spasmodic, or irregular, they ought, before anything else is done, be stimulated in the first case, and made regular by opium or chloroform in the second. "I recollect several cases," he says, "in which the head, after having been forced down by the very violent contractions, rose again above the superior strait, until the very irregular contractions were made regular by the use of opium."

Contraindications.—Besides the irregularity of the contractions, which it is always easy to remedy, version by external manipulation is necessarily excluded by all circumstances requiring a prompt termination of the labor. Thus, hemorrhage, convulsions, syncope, rupture of the uterus, prolapsus of the cord, fœtal monstrosities, &c., are so many contraindications to the operation. The case is the same with twin pregnancies, which makes it very difficult to diagnose the presentation of both children, and in which it is not always easy to know whether the pressure is exerted upon both extremities of the same fœtus.

Positions of the Child, in which Version by External Manipulation ought to be performed.—As was stated on page 841 *et seq.*, the presentations of the vertex and pelvis are liable to certain irregularities or inclinations, which, in the great majority of cases, are corrected spontaneously when the membranes are ruptured, but which not unfrequently continue or facilitate the production of presentations more unfavorable still. In this case, the presenting part, head or pelvis, has no disposition to engage in the superior strait, but strikes against one of its borders. The longitudinal axis of the fœtus is not in the direction of the axis of the pelvis, but is more or less inclined to it. At other times, what is still more serious, it lies transversely, so as to form a trunk presentation; now, it is especially in these oblique or transverse positions of the fœtal axis, that version by external manipulation may be performed with advantage, and we shall borrow from Wigand the course to be pursued.

1. *Preliminary Measures.*—The first precaution is to make as sure as possible of the position of the child and the exact situation of the head and pelvis. Without entering into the details already given whilst treating of each presentation, we recall briefly that the accoucheur ought to make use successively of abdominal palpation, whereby he recognizes the fœtal inequalities, of the touch, performed whilst the patient is standing and whilst lying on the back, and finally, of auscultation. He will take especial note of the form of the uterine tumor, of the greater or less protrusion of the bag of waters, and of the impossibility of reaching any part of the child by the finger in the vagina.

The position the woman should take varies according to circumstances. Generally, she ought to lie upon the side in which is situated the part of the child which it is desired to bring to the opening. Thus, if this part be the head, and it rests upon the left ilium, the patient should lie on the left side. The lateral decubitus ought not to be carried too far, but just so as to direct the umbilicus slightly to the left. To give the abdomen a solid support, a thick and hard cushion, or a cloth several times folded, should be placed beneath, and against which the woman must be careful to press strongly, at the same time assisting herself with her hands. The change of position should be made between the pains, lest the displacement of the child in connection with the uterine contraction should occasion rupture of the membranes.

If the diagnosis has not been clearly made out, the patient will lie upon the left side, this being the position appropriate to the greater number of cases.

Decided anteversion, with the head resting upon the crest of the pubis, demands the dorsal decubitus, the pelvis being at the same time slightly raised, and the abdomen supported by a broad bandage in the hands of assistants.

The position of the accoucheur will be various and sufficiently indicated by the operation he is about to undertake.

Both the bladder and rectum ought, of course, to be emptied.

Mode of Operation.—In some cases of simple obliquity of the child, the mere position, aided by the cushion placed beneath the side of the abdomen, has proved sufficient to accomplish the reduction, though most frequently, especially in transverse presentations, external manipulation becomes necessary.

The accoucheur ought always to endeavor to cause that extremity of the child to descend into the strait *which is nearest the opening of the pelvis.* Breech presentations are not so unfavorable but that we may, in some cases, give up the attempt to bring the head down first, in order to avoid too long-continued and perhaps hurtful efforts.

Suppose, then, the child to be in the left cephalo-iliac position of the right shoulder. The operator, being to the right of the bed and wishing to depress the head, places his right hand upon it, and whilst endeavoring to make it descend, he, at the same time, endeavors to raise the pelvis by pressing it upward with his left. Acting thus in opposite directions with his hands, and endeavoring to preserve accordance in his motions, he makes light frictions on the two extremities of the child; if these be not successful, he will press more strongly, always acting at the same time on both extremities.

As soon as the cephalic extremity is brought to the superior strait, a few moments should be allowed to pass, in order to be certain that it is well fixed there; then the membranes ought to be ruptured, so that the contraction of the womb may keep the child in its new position.

When the head happens to be in the neighborhood of the uterine orifice, as in oblique or inclined positions of the vertex, it will suffice to press with a single hand [illegible] the abdomen corresponding with the breech, whilst two fingers of the other hand, passed into the cervix, slide the head over the edge of the strait and rupture the membranes at the proper moment.

It is easy to understand the modifications required by the operation, when it is decided to bring the breech, instead of the head, to the superior strait.

The change once made, the delivery is left to nature, though, if difficulties should occur, the usual means will be employed for their removal.

External manipulation may be practised with any amount of dilatation of the cervix, though it were best, in general, not to rupture the membranes until the dilatation is pretty far advanced. When, at the commencement of labor, the accoucheur detects an oblique position of the head or breech, or a presentation of the trunk, he ought first merely to put the woman in a proper position, and by means of a folded cloth or hard cushion placed under the side of the abdomen, make pressure upon the part of the child which he wishes should engage. At the same time, he insists upon absolute immobility, especially during the pain, and if, after waiting five or six hours, these measures have not sufficed to change the presentation, he will have recourse to external pressure as already described. When the conversion is effected, the membranes ought to be ruptured at once, provided the dilatation of the cervix is advanced, but if otherwise, the woman should be merely kept upon her side and proper pressure maintained upon the abdomen. Sometimes, notwithstanding these measures, the child resumes its faulty position, and then the whole operation has to be repeated, and the membranes broken immediately after.

c. *During Labor and after Rupture of the Membranes.*—Under these circumstances, version by external manipulation is advisable only in oblique positions, when the head or breech are very near the cervix, the membranes broken only a short time before with a certain amount of water remaining in the uterus, and the child possessing considerable mobility. Even then, it were proper to be very careful and not continue too long attempts, whose least inconvenience would be the loss of precious time. For my own part, I would prefer, if the dilatation of the neck allowed it, to take advantage of the favorable conditions and perform the pelvic version. For a stronger reason, would I be disposed to advise the same thing to be done in transverse presentations of the trunk.

Flamand did not restrict the rule to bring down the head in trunk positions to the cases just indicated; but he was also in favor of the performance of the cephalic version, even after the rupture of the membranes and the discharge of the amniotic liquid. He has even gone so far as to point out the particular manœuvre for each one of the distinct presentations admitted by him, for the child's anterior, posterior, and lateral planes. (*Journ. Complement. des Sciences Médicales*); but we deem it useless to enter into his long details, more especially since they may all be comprised in this: to grasp the presenting part, push it up above the strait, and then carry it as far as possible towards the side opposite to where the head is found; and afterwards get hold of the head, and bring it down, if the efforts made by the other hand through the abdominal walls have not proved sufficient to make it descend into the excavation.

Flamand himself acknowledges that this operation seldom succeeds, excepting when some region of the neck or upper part of the thorax presents at the strait. For our own part, we believe it would be difficult, even under such circumstances; however, it is barely possible, especially if there is still some water in the uterus, and the contractions are not very energetic; still, under the circumstances, we should think it right to endeavor to effect the object. But where a long time has elapsed after the rupture of the membranes and the total discharge of the amniotic liquid, and the womb is strongly contracted, we do not hesitate to recommend the pelvic version in preference; and particularly so, in those cases in which some region of the lower half of the trunk presents at the centre of the strait.

In common with many of our contemporaries, we had hitherto advised cephalic version in cases of contracted pelvis, from a fear of the difficulties to which an arrest of the head above the superior strait would give rise. An interesting memoir, by Dr. Simpson, having again directed our attention to the advantages and disadvantages of pelvic version, we subjected the known facts to a careful examination, and now confess that the reading of the memoir has greatly changed our opinion. We are, at present, convinced that the dangers of pelvic version, in cases of contracted pelvis, have been much exaggerated, and do not hesitate to recommend this operation in preference to cephalic version, which would prove very difficult after a complete evacuation of the waters, and, after all, would require the forceps to be applied.

Still more strongly would we prefer pelvic version, if the pelvis were one of the kind in which the narrowing affects one side much more than the other; that is to say, one in which the sacro-vertebral angle, though projecting strongly forward, is, at the same time, turned to one side, as in the oblique-oval pelvis of M. Nægèle, for it would enable us the more easily to direct the back, and the large occipital extremity of the head toward the most roomy side of the pelvis.

When a trunk presentation is complicated by the descent of an arm, the cephalic version, recommended by Ruffius (*humeri repellendi ut cadet caput*), Rhodion, and others, should, in my estimation, be wholly rejected; since the necessity of a previous return of the arm would then render the version by the head exceedingly difficult, if indeed, as before stated, the premature rupture of the membranes did not constrain us to abandon it altogether. Consequently, the pelvic version would appear to be far preferable in cases of this kind.

Presentations of the Pelvic Extremity.—"Partisans, as we are, of the version by the head," says Flamand, "we are not prepared to propose it in these cases indiscriminately, notwithstanding we are that way inclined. But after a consideration of the following suppositions, we do not doubt that every unprejudiced accoucheur will follow our advice, and attempt this operation.

"Supposing that a monstrosity were to present without any lower extremities whatever, or one having only a couple of little stumps near the buttock, too small to furnish a sufficient hold for the accoucheur's hand to draw down the breech, and at the same time the mobility of [illegible] indicates the possibility of bringing down the head, who would hesitate to attempt the operation?" For ourselves, we should not hesitate to leave the delivery entirely to the powers of nature; for what would be gained by drawing on the pelvic extremity? Have not the precepts of Madame Lachapelle, of Desormeaux, of Dubois, and others, taught us, that all tractions on this extremity are more hurtful than beneficial? And would not some of those disadvantages that Flamand and his followers refer to the delivery by the breech, and on which they rely for advising the cephalic version,—would not they result in consequence of such imprudent tractions?

"Supposing a woman has but three inches and three lines in her sacro-pubic diameter, and that in former labors she has lost several children that were delivered by the breech; and besides, that the fœtus appears sufficiently movable at the time when, or shortly after we are obliged to rupture the membranes—an attempt to effect the version by the head is warrantable."

We likewise believe that, in such a case, the accoucheur would be justified in making this attempt before the membranes are ruptured; but after the discharge of the waters, it appears to us that this operation must be impracticable in a large majority of cases; and we should then prefer well-conducted tractions on the trunk of the child, using every exertion to keep up the flexion of the head at the moment when the latter reaches the superior strait. The observations of Madame Lachapelle, and those published more recently by Dr. Simpson, afford a satisfactory reason for our preference, even in those cases where the pelvic contraction results from the direct forward projection of the sacro-vertebral angle; and this precept would be still more applicable, if one of those pelves described by M. Nægèle, under the name of oblique-oval, were to be met with. For the tractions then made on the breech would have the effect of turning the child's back, and, as a consequence, the large occipital extremity of the head, towards the widest part of the pelvis.

To recapitulate: Version by external manipulation ought to be attempted, in oblique or transverse positions of the body of the child, only during labor, and, if possible, before the membranes are ruptured. Should, however, but a few moments have elapsed since the rupture took place and a certain amount of water remain in the womb; if, in short, the child is still movable, and the part to be brought down very near the cervix, some attempt may yet be made with this object; but, should difficulty be met with, pelvic version must be employed instead.

If the faulty position of the child has been discovered before labor, the preventive measures already mentioned should be had recourse to, and external manipulation left until labor has begun.

ARTICLE II.

OF PELVIC VERSION.

This is an operation whereby the pelvic extremity is brought to the superior strait, from which it had been more or less removed.

As stated in the preceding article, this result may be obtained by external manipulation performed before the membranes are ruptured. We gave a formal statement, however, of contraindications for this method, even though the membranes be intact. It frequently happens that the accoucheur is not called to the patient until long after the waters have been discharged, and then first discovers the faulty position of the child. As in all such cases, pelvic version by internal manipulation is indispensable, we shall have to study the subject with the greatest care.

In the first place will be given the general rules applicable to all cases of this operation, and afterward the peculiarities presented by each of the presentations of the vertex, face, and trunk. Before operating, it is well, however, to observe certain precautions which may facilitate the process at a later period, and especially is it necessary to bear in mind the *conditions* necessary for the performance of the operation.

§ 1. PRECAUTIONS TO BE OBSERVED.

Before studying the general rules for the performance of pelvic version, we will point out briefly certain precautions to be observed by the operator, and which apply to all cases.

1. In the first place, the accoucheur ought to apprise the patient of the operation he is about to perform, to make her understand as clearly as possible the necessity for resorting to it, and to calm her anxiety, and to remove any fears as to the unfavorable consequences it may have either upon herself or the child.

2. As soon as the woman shall have consented to the operation, she is to be placed in a suitable position, which position varies very much in different countries, and even according to individual accoucheurs. The following is the one generally preferred in France: the woman places herself across the bed, one side of which rests against a wall or some tall piece of furniture; several pillows are then piled up under her back, so as to keep the upper part of the body moderately elevated; and that the sacrum, by resting on the free side of the bed, may leave the vulva and perineum entirely exposed. The lower extremities are moderately flexed, the feet resting on two chairs, and supported by two assistants standing on the outside of the limbs. When the patient is very intractable, or fears that she cannot control her movements, another assistant holds the pelvis in a fixed position by grasping the iliac crests.

In England, women are usually delivered on the side; and they are placed in the same position whenever it becomes necessary to resort to any operation; the precaution being taken, however, to bring the breech to the side of the bed, and to place a cushion between the knees, for the purpose of keeping them apart.

It were well worth while, in some cases at least, to adopt this position. When, for instance, the dorsal region of the fœtus is directed backward, the lateral decubitus sometimes allows the hand to reach the feet with greater facility; in the dorso-anterior position, on the contrary, turning is more easily effected whilst the patient lies upon the back.

3. As the little bed on which women are delivered is often too low, and therefore incommodious for the operator, some practitioners direct a mattress to be placed on a bureau or any other article of furniture of a proper height,

to which the patient is to be transferred. In most cases, the accoucheur will, no doubt, be obliged to go down on his knees, or sit on a low chair, which position is often inconvenient, and obstructs the operation. When the bed is too low, it should be raised by means of a folded mattress, or else the woman may be placed upon some higher piece of furniture. Generally it is only necessary to turn the bed in such a way that one of its sides will be supported against the wall, and to place the woman crosswise on it, taking the precaution, if necessary, to elevate her breech by slipping a pillow under the first mattress; this is such a simple affair that she will scarcely perceive it, and it will not disturb her in any way.

4. The accoucheur ought to throw off his coat, as the forearm has to be introduced into the parts as far up as the elbow. He will also have a proper number of napkins prepared and placed at the foot of the bed to wipe his hands, and to envelop the body of the child as it shall be extracted.

5. Before operating, he should again ascertain the child's position. We need only refer here to the diagnostic signs in each presentation, that have been pointed out in describing natural labor.

6. The position being clearly recognized, it will be necessary to decide on the choice of the hand by which the version is to be performed. In the presentations of the vertex, face, and breech, we introduce that hand which, being held midway between pronation and supination, has its palmar surface turned towards the child's anterior plane; while, in those of the trunk we introduce the hand having the same name as the presenting side of the fœtus (the right hand for the right side, and the left hand for the left one), whenever we intend to perform the pelvic version. As to the cephalic version, it is difficult to lay down any general rule for the particular hand to be used, since this varies according to the particular case.

The hand and forearm chosen are then covered by some fatty substance, with a view of facilitating their introduction, and, at the same time, of protecting them against the contagion of any diseases the woman might be affected with. Care should be taken to grease only the dorsal surface of the hand, which alone comes into contact with the mother's parts, the palmar face having to apply itself to those of the fœtus which are too slippery already.

7. In those cases in which the version is rendered indispensable by some accident that threatens the life of the mother or child, and, consequently, where it is not possible to choose our own time, we evidently have to operate as soon as the gravity of the case renders it advisable; but in those in which a malposition of the infant constitutes the whole difficulty, as in the trunk presentations, for example, the operator (if attendant on the patient from the commencement of her labor) should bear in mind that, when the bag of waters is still intact, or else so recently ruptured that a considerable quantity of water still remains in the uterine cavity, the introduction of the hand and the evolution of the fœtus are much easier than at any other time; and, consequently, he ought to select that moment for operating, provided always the os uteri is sufficiently dilated.

§ 2. Necessary Conditions.

In order to perform the pelvic version, it is requisite that the os uteri be dilated or dilatable; that the presenting part be not engaged too deeply in the excavation, and more particularly that it has not cleared the neck of the uterus; finally, except in trunk presentations, most authors require that no disproportion exist between the size of the head and the dimensions of the pelvis.

1. It is necessary, we say, that the os uteri be sufficiently dilated or dilatable to permit the ready introduction of the hand, and the free passage of the child. The neck may be considered as being properly dilated, when its orifice offers nearly two inches in diameter; but it may be much less open, and yet the version be still possible, because it is then often sufficiently dilatable. In the latter case, the cervix is thick, soft, supple, and easily distended; it is neither tense nor contracted, and the finger, on being passed over the divers points of its circumference, finds that it does not resist in the least, and that it admits of being readily enlarged. This dilatability of the uterine orifice is particularly apt to be met with, when the presenting part cannot engage in the os uteri after the membranes are ruptured, on account of its volume or bad position; because, being no longer sustained, the margins then relapse towards its centre, and thus diminish its size.

2. The second condition is, that the presenting part be not too deeply engaged in the excavation, and more especially that it has not cleared the cervix. It will presently be seen that, before endeavoring to enter the uterus, the hand of the accoucheur ought to push the part, which is already more or less engaged in the excavation, above the superior strait. Now, it is evident that if this part had cleared the os uteri, it could not be returned without the womb being pressed back at the same time, and consequently without exposing the utero-vaginal attachments to laceration.

3. When the pelvis is contracted, most French accoucheurs proscribe pelvic version. Although we also at one time adopted this view, we now think that it should be reserved for those cases only in which the narrowing affects all the diameters of the pelvis, or in which the sacro-pubic diameter is excessively shortened. An attentive examination of this question has convinced me that Madame Lachapelle, Dr. Simpson, of Edinburgh, and Mr. Radfort, of Manchester, were right in preferring pelvic version to the application of the forceps in some cases. We shall discuss this important practical point in the following chapter, but we feel justified in saying at present that version may be practised with advantage: 1, in the oblique-oval contractions of M. Nægèle; 2, in those antero-posterior contractions of the inferior strait complicated with a considerable narrowing of the sub-pubic arch. (See *Forceps*.)

Below two inches, the antero-posterior diameter of the pelvis is so short as to render it impossible to introduce the hand. A contraction so great as this, makes it unnecessary to insist much upon attempts at version.

§ 3. General Rules of the Operation.

The operation, in the performance of podalic version, is composed of three principal stages, namely, the introduction of the hand, the evolution of the child, and the extraction of the latter.

1. *Introduction of the Hand.*—The patient having been properly placed, the operator sits down or rests on one knee before her, then presents his hand

at the entrance of the vulva, and endeavors to introduce it by pressing gently from before backwards, and slightly from above downwards. If the vulva is very large, the fingers are held together and introduced, flat first, taking care to depress the anterior-perineal commissure with the cubital border of the hand; but if the vulva is very narrow, the fingers are introduced one after another, and then brought together in such a way as to form a kind of gutter, in which the thumb can slip along their palmar concavity, and thus enter imperceptibly. The hand thus forms a cone, the base of which is still at the exterior, while its apex endeavors to penetrate up into the vaginal cavity. The wrist is then slightly depressed, in order to accommodate the direction of the hand to the line of axis of the inferior strait; and, as the fingers penetrate deeper, it is depressed more and more, so as to make the hand describe a curve with its concavity anterior, corresponding to the pelvic axis. The introduction is facilitated by gently and moderately rotating the hand on its own axis, with a view of effacing the folds of the vagina.

Whenever possible, the introduction into the vulva must be made during the interval between the pains. Ant. Dubois gave a different precept, and taught that it was preferable to make the introduction while the pain lasted; for, said he, the woman, being engrossed with the uterine pain, will not perceive that caused by the entrance of the hand. But every one who has attended a female in labor, and has made the vaginal examination during the contraction, must be convinced of the error of this celebrated accoucheur.

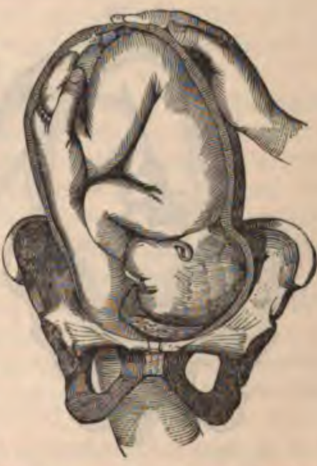
The fingers, having reached the upper part of the vagina, may find the os uteri either freely dilated or sufficiently dilatable. In the former case they can be made to penetrate into the organ without any difficulty, by placing them between the internal surface of the uterus and the presenting part of the child; but, in the latter, they are to be introduced one after the other, in such a manner as to form a cone, the extremity of which is entered in the orifice. Then the hand is pushed along, imparting to it at the same time some gentle rotatory movements, and separating the fingers a little from each other, so as to make a moderate and uniform pressure on the various points of the periphery of the cervix. When the services of an assistant can be obtained, he should be directed to place both hands over the fundus of the uterus, in order to prevent it from being pressed up by the efforts made to introduce the hand; if there is no assistant, the other hand of the accoucheur is placed over the fundus to perform the same office. Without this precaution, there would be danger of lacerating the vagina at its point of attachment with the uterus.

The os uteri ought to be entered during the interval of the pains. As soon as the hand has reached the cervix, it is necessary to ascertain that we have not been mistaken about the position; and in case an error has been committed and the wrong hand has been introduced, it should be withdrawn at once, and replaced by the other, if there is reason to anticipate much difficulty in the version; that is to say, if the membranes have been ruptured a long time, the pains are strong, and the waters are wholly discharged; for we ought not to add to the difficulties that already exist by the choice of the wrong hand. But, under opposite circumstances we might use the hand first introduced, so as to spare the patient the pain and repugnance which the introduction of a second one always occasions her.

When the hand arrives at the os uteri, the membranes may either be still intact, or they may have been ruptured for a long time. Supposing the former to be the case, the question arises, are they to be ruptured before passing any further? It is far better to insinuate the hand between the external surface of the membranes and the internal one of the womb, and thus get it up to the point where, from the child's position, we know the feet ought to be found; and only rupture the membranes at the moment when the lower extremities are seized, or at least not until after the whole hand has penetrated into the uterine cavity. Both processes have their advantages: the first is the most expeditious and does not, whatever may be said to the contrary, permit a too rapid discharge of the waters, for the simple reason that the presence of the forearm in the mouth of the womb stops it almost completely. In the second, by leaving the membranes unbroken until the feet are grasped, we have the great advantage of reaching the fundus uteri much more easily, of turning the feet more promptly, and of practising the second stage or evolution of the fœtus more readily, the latter being yet movable in the surrounding waters. If the hand finds the placenta attached to one side of the organ, as it advances between the internal surface of the womb and the external one of the membranes, it is very necessary to avoid its detachment, which might be done by passing around its margin; and where this is impracticable, to rupture the membrane at the inferior border of the placenta.[1]

The introduction of the hand is far more difficult when the membranes are broken, for the presence of another foreign body stimulates the contractions still more, and it were folly to endeavor to overcome them. It is therefore advisable to suspend all attempts, and only renew them when the pains are a little calmed. The first step in the process is to get hold of the presenting part, and push it up a little above the superior strait; then it is to be carried toward one of the iliac fossæ, where it is sustained, first by the palm of the hand, and afterwards by the anterior surface of the forearm. This pressing back, which is easy when the fœtus is still somewhat movable, becomes impossible when the waters are entirely discharged; in this case our efforts should be limited to gliding the hand between the neck and the presenting part. The mode of reaching the feet varies

FIG. 120.



In this figure the head has been pushed up into the left iliac fossa, and one hand gets hold of the feet while the other supports the organ externally.

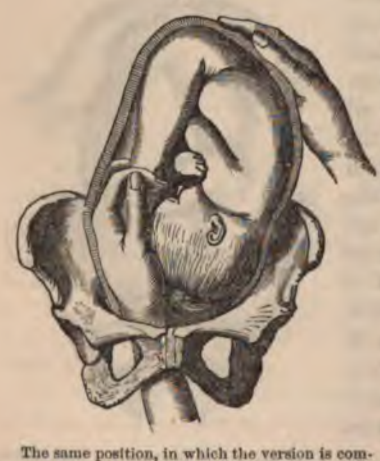
---

[1] This plan is recommended by Peu, Smellie, Deluerye, Hamilton, Boër, Nægèle, and Madame Lachapelle. The latter has even been careful to suggest another precaution; namely, to rupture the membranes during the relaxation of the uterus, lest its contraction drive out a large portion o

according to the particular position. Some accoucheurs have laid it down as a general rule to pass the hand around the side of the child that is directed towards the mother's loins, and then slip it along its back and breech, and down along the posterior surface of the lower extremities to the feet. For, by following an opposite course, and laying it flat on the anterior surface of the fœtus, and thus guiding it directly to the feet, nothing would be easier than to mistake the hand for a foot, or an elbow for the knee, in the folded-up condition of the superior and inferior extremities. There are some cases in which this direction may be followed, but in many others it is useless or impossible to take this precaution: useless, when a considerable quantity of water still remains in the cavity of the uterus; and impossible, where the membranes have been ruptured for a long time, and the uterine walls are forcibly retracted on the child's trunk; for then we must be content with slipping the hand flat along the anterior plane of the fœtus, being careful not to confound a foot with a hand.

2. *Evolution of the Fœtus.*—Having succeeded in finding the feet, the hand grasps them in such a way, that the index finger is placed between the two internal malleoli, the thumb on the external surface of one leg, and the three fingers on the external side of the other. Such at least is the direction given by many medical authors, but in practice we cannot always do what we would, and it is only necessary to be certain that we have a firm hold of them. (See Fig. 120.) It is sometimes difficult to seize both feet at the same time; and we must then be satisfied with a single one, provided the search after the second is attended with considerable difficulty. The feet are then drawn upon in such a way as to double up the fœtus on its anterior plane. During the performance of this evolution, which is always to be done during the interval between the pains, the other hand should be placed over the part of the abdomen where the head is found, and by pressing up, the latter should endeavor to make it ascend towards the fundus of the womb. It sometimes happens, as just stated, that only one foot can be brought down into the vagina, and if this is the anterior or sub-pubic one, the operation might be terminated without going in search of the other; but if, on the contrary, it is the posterior foot, we should, after having secured it with a fillet,[1] introduce the hand anew, and follow the internal

FIG. 121.



The same position, in which the version is commenced by drawing down the feet.

---

[1] The fillet usually consists of a piece of tape, one or two fingers' breadth wide and a yard long, made into a loose slip-knot, which is applied above the ankle; when the foot is still in the vagina, the knot is placed on the dorsal surface of the hand, and then, by grasping the foot, it is slipped over it above the malleoli, and afterwards tightened by drawing on the two extremities of the tape that hang down at the vulva.

border of the limb already extracted, up to the root of the opposite leg; whence by tracing out the latter, we finally get to the other foot, which is to be brought down in a line of abduction. It is to be understood, however, that it is possible and often easy to turn when the posterior foot only can be got hold of; in which case, the course to be pursued will be pointed out hereafter.

In some cases, it is much easier to seize the knees which present to the hand of the accoucheur, and they might then be drawn upon without inconvenience for the purpose of effecting evolution, but relinquished when brought down far enough to allow him to get hold of the feet.

3. The *extraction* is the only stage of version performed during the uterine contraction. In fact, as the latter facilitates the tractions made on the pelvic extremity, and likewise serves to keep the head flexed on the chest, the accoucheur would be justified in terminating the labor, without waiting the return of the pain, only when there was a complete inertia of the womb conjoined with some accident requiring a prompt delivery.

At first, we must draw on the sub-pubic limb as much as possible, because we thereby encourage the rotation of the anterior plane of the child towards the mother's loins, and we are better enabled to press the parts backwards; that is, to get them in the direction of the axis of the superior strait, which they have to traverse. If the posterior foot is the one brought down, the version may be completed successfully with it alone. In order to accomplish it, the limb should be rotated to the right or left whilst being drawn upon; the breech, generally following the movement thus communicated, will descend with its greatest diameter corresponding to the transverse diameter of the pelvis. Continued traction in the same direction finally brings under the pubis the foot which at first was behind, and the operation is completed as under ordinary circumstances.

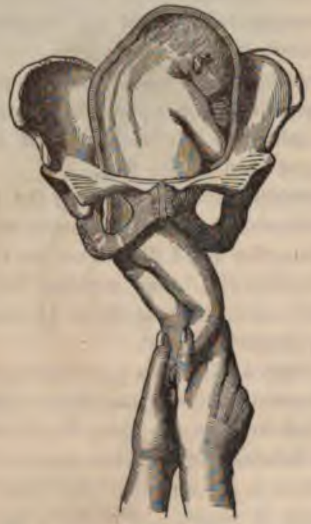
As the lower extremities are delivered, the whole extent of the disengaged parts are grasped by the two hands, taking care to place the thumbs on the posterior part of the limbs, the index and medius on their external surface, and the ring and the little fingers on their anterior surface. When the breech appears at the vulva, it is necessary to ascertain the state of the cord; for that purpose, a finger is to be slipped up to its umbilical insertion, when, if it be found tense, the thumb is joined to the finger, and by making a gentle traction on its placental extremity, by both, the loop it forms will be enlarged (Fig. 123). If the cord has slipped over one leg, and got into the fissure between the thighs, it will likewise be necessary, after having drawn slightly on it, to disengage the child's posterior limb, and place the cord in contact with the perineum.

In case the version has been demanded by an unfavorable position, and

When the foot is high up in the vagina, it is often very difficult to apply the fillet: in this case, M. Van Huevel proposes substituting for it a long forceps, the upper extremity of whose branches terminate in a half ring placed at right angles upon the stem. When the forceps are closed, we have a complete ring, by means of which the leg is seized above the malleoli. But why should instruments be so multiplied without absolute necessity?

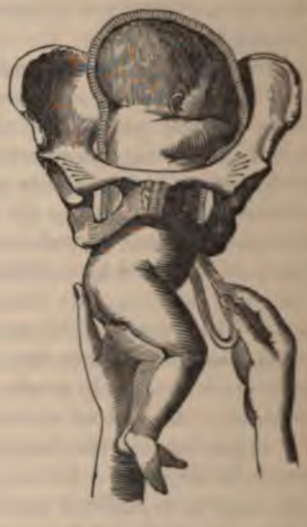
the child has been restored to a natural one by the pelvic evolution, the rest of the travail is left to nature; provided always the force and frequency of

FIG. 122.



The version is here completed, and the occiput, which was placed in the left iliac fossa, at the commencement of the operation, will now come down behind the right acetabulum.

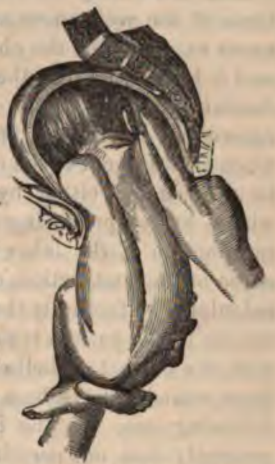
FIG. 123.



Management of the cord.

the pains are such as to give us reason to anticipate a speedy delivery. But if the uterine contractions are feeble or slow, or if the severity of the symptoms endanger the life of either the mother or the child, the tractions must be kept up, and the patient be encouraged to aid them with all her remaining strength. The hips, loins, and lower part of the chest soon come down; and as this delivery progresses, the accoucheur's hands ought to embrace as many parts as possible, constantly seizing those that are nearest to the vulva, and taking care always to act on the bones, not on the soft parts. The arms are apt to become stretched out along the sides of the head, and thus descend with it into the excavation; when their disengagement must be effected in the following manner: we commence with the posterior one, which has only the resistance of the soft parts of the perineum to overcome, and therefore will offer less difficulty than the sub-pubic arm. The same hand is again used by placing its index and middle fingers on the posterior and external side of the arm, just beyond the humero-cubital articulation, while the thumb rests on the anterior internal plane of the humerus, where it acts like a splint; the axillary space is thus found lying in the interval that separates the thumb from the two fingers (Fig. 124). The trunk having been enveloped in a napkin is next carried up in front of the pubic symphysis, either by the other hand, or by an assistant. Then the fore and middle fingers, acting over the whole extent of the arm and a part of the forearm, bend the latter down over the side of the head and face towards the chest, on the side of which it is ultimately placed after its complete disengagement. The sub-pubic arm is next delivered by supporting the child's trunk upon the other forearm, and depressing it towards the anus, while the hand, not the one engaged in the previous operation, is introduced in a state of forced pronation; that is, turned over on its radial border in such a way that the thumb can be still applied on the internal, and the index and middle fingers on the posterior surface of the arm; and then this is brought down over the side of the head, face, and front of the chest, as was the posterior arm.

Fig. 124.



Delivery of the posterior arm.

In ordinary cases, the head descends flexed into the excavation, the occiput being turned towards some point adjacent to the symphysis pubis, and the disengagement is effected spontaneously if the pains are tolerably strong and frequent; and if necessary to facilitate it, we have only to carry the trunk up in front of the symphysis. But should it happen that the expulsion of the head is somewhat delayed, we must aid it by introducing two fingers on the sides of the nose, and two others on the occiput, and then, by means of the latter, the operator pushes up the occiput, while he draws down, on the contrary, with those implanted on each side of the nose, and thus determines a movement of flexion which secures the delivery of the head. The difficulty would be much greater if the face was turned forward, and the occiput backward; though even here, if the head is not very voluminous, and the pelvis is large, we might effect its delivery by depressing the trunk on the perineum, and by drawing down the face in the pubic arch, with the fingers planted on the sides of the nose, so as to flex the head; or, on the other hand, by carrying the trunk up in front of the pubis, we might, in some exceptional cases, succeed in delivering the occiput first at the anterior perineal commissure. (See *Mechanism of Labor in Breech Presentations.*)

§ 4. OF THE DIFFICULTIES THAT MAY BE MET WITH IN PERFORMING THE PELVIC VERSION.

In common simple cases, the manœuvre is accomplished in the way we have just described; but it frequently happens that the operator encounters difficulties in its performance, dependent either on the mother or on the child, which next claim our attention. Those which the mother's organs may present are, a very small vulva, obstinate resistance of the uterine orifice, spasmodic contraction, and mobility of the body of the womb, and insertion of the placenta over the os uteri. Those appertaining to the fœtus are, shortness of the umbilical cord, unusual size of the shoulders, crossing of the arms behind the neck, and extension of the head.

A. *Smallness of the Vulva.*—Unless the smallness of the vulva results from the persistence of old adhesions, it is seldom s [illegible] first pregnancies, as to constitute a serious obstacle to the introduction of the hand. The only precaution to be taken is to pass in the fingers one after the other, and to make the hand enter gently and carefully.

B. *Resistance of the Uterine Orifice.*—The causes and principal indications of the resistances which the uterine orifice may offer to the spontaneous expulsion of the child, have already been studied (page 698, *et seq.*); and it is possible that these same difficulties may be met with in the performance of the version. Here, also, the retraction may be seated at the external or internal orifice of the neck. Two conditions may be met with when the external is the only one affected; that is, the pelvic evolution may be necessitated, either by a trunk presentation, or else by some accident which, by compromising the life of the mother or child, renders a prompt termination of the labor imperative. In the former case, whatever be the cause of the contraction, or of the non-dilatation of the orifice, all the means calculated to facilitate the dilatation will be brought into use; such as venesection if the patient is plethoric, tepid bathings, fumigations, and unctions with the extract of belladonna on the periphery of the cervix; and, where these remedies have been employed without success, we should act as in the following case. In the latter case, the necessity of terminating the labor promptly does not permit us to rely on the employment of the means just enumerated, because their action is not developed for some time; and our only resources are in a forced introduction of the hand, or multiple incisions on the neck. We have hitherto stated that, as a general rule, the repeated incisions of the cervix appear decidedly preferable to a forcible introduction of the hand, which latter is always a slow, difficult, and very painful operation, whilst the instrument is not even felt by the patient; besides, it is not dangerous, and its results can be more certainly relied on. It is, however, very necessary to take in consideration the nature of the accident which, in this state of the cervix, demands the intervention of art; for, in this respect, hemorrhage or eclampsia may present very different indications. In the former, it is very probable that the contraction of the orifice is slight, and capable of being overcome without much difficulty; besides, should it fail, the attempts at forcible introduction would have the effect to irritate the organ and excite the contraction of the fibres of the fundus, whose inertia had probably caused the flooding which demands the termination of the labor. But, during an attack of eclampsia, there is every reason for supposing that the contraction of the orifice is due to the convulsions, with which every muscle of the body is affected. Hence, it is not of a character to yield readily to attempts at introduction, and, in case of insuccess, it may be feared lest, by irritating the very sensitive fibres of the neck, they might have the effect to increase the general convulsions which we wish to remedy. Therefore, we should, in this case, give preference to incisions.

When the spasmodic contraction is confined exclusively to that portion of the uterine walls which constitutes the internal orifice in the non-gravid state, the hand, after having penetrated the external one without difficulty, is suddenly arrested by an obstacle that it cannot surmount. This retraction is apt to take place, in the presentations of the cephalic extremity, around the child's neck after the head is free, but it is oftener observed in trunk presentations. The measures that we shall presently point out for combating the spasmodic contraction of the body of the womb, are equally applicable in cases of this kind.

C. *Insertion of the Placenta on the Neck of the Uterus.*—As is well known, this circumstance is an habitual cause of hemorrhage, and often requires the pelvic version. When the placenta is only attached by one margin to some point of the uterine neck, the hand is introduced at the part which is not covered, and the version presents nothing peculiar. But a different course has been advised relatively to the introduction of the hand, where the insertion takes place, centre for centre, and no portion of the circumference of the placenta is detached. Thus, it has been recommended to perforate the centre of the after-birth, and introduce the hand through this opening; but this appears to us a difficult and dangerous process, because: 1st, a great number of umbilical ramifications are then necessarily torn, and a hemorrhage produced which may speedily prove fatal to the child; 2d, the force necessary to effect this perforation is sometimes sufficient to drag upon, and then detach, the periphery of the still adherent placenta; and, 3d, the central opening made in the after-birth will seldom be spacious enough to permit the child's trunk and head to pass freely; whence it may happen that the frictions made by the movable parts of the fœtus against the margins of this opening, will facilitate a displacement of the arms and an extension of the head. Consequently, unless the patient's strength be already exhausted by the flooding, or the placental adhesions be very strong, we would rather detach some point of the circumference of the placenta, and thus get the hand between its external face and the internal wall of the uterus. True, by operating in this manner, we should lacerate a certain number of utero-placental vessels, and thereby add to the sources of hemorrhage, but we would succeed in saving the child's blood; besides which, the hand and forearm, at first, and then a little later the trunk of the fœtus, by becoming applied over the mouths of these vessels, would compress them like a tampon, and thus put an end to the hemorrhage.

D. *Violent Contraction of the Body of the Womb.*—This is a condition that always makes the version very painful and very difficult, and, in certain cases, may even render it impossible; it is, therefore, a sufficient reason for preferring an application of the forceps when the cephalic extremity presents. But, in a case of trunk presentation, version would be the only practicable measure; and even that might be rendered wholly impossible by the retraction of the uterus. I have succeeded very well in such cases by introducing the hands one after the other several times, and using gentle efforts to pass them deeply into the uterus. The muscular fibre of the organ being thus fatigued, sometimes relaxes, and allows the feet to be reached. Here, likewise, venesection and tepid bathing prove very useful; and the employment of opiates is particularly indicated, for the aqueous extract of opium, when administered in injections, or by the stomach, in the dose of three-quarters of a grain to two grains, or an equivalent quantity of laudanum, is usually found sufficient to overcome the resistance of the body of the womb. Under such circumstances, Dewees highly ex
general bleeding, carried to syncope; and he makes th

during the operation, whenever possible, so as to produce this effect more speedily.

I had an opportunity of putting the advice of the American accoucheur into practice, for the first time, on a lady in the Rue du Four-Saint-Germain, to whom I was called in consultation by Dr. Trèves. The child presented by the left shoulder; notwithstanding which, ergot had been administered, in consequence of an error of diagnosis, and the uterus was so contracted on the trunk of the child that an introduction of the hand was altogether impossible. I made the patient get up, and had her supported by two assistants; the vein was opened, and I permitted the blood to run until the woman fainted; when she was immediately replaced on her bed, and the version was effected without difficulty.

If these measures fail, and the child be still living, there is evidently no other resource than to wait and hope for a spontaneous evolution from the expulsory efforts of the uterus. If it be dead, the section of its neck, according to the plan of Celsus, and a separate extraction of the trunk, and afterwards of the head, ought to be immediately practised, with a view of sparing the patient the disastrous consequences of a prolonged and usually a uselessly prolonged labor. (See *Embryotomy*.)

Again, the contraction of the uterus very frequently renders the efforts made during the version to turn the anterior plane of the fœtus backwards ineffectual; and where this is the case, it is not advisable to operate on the trunk, by pushing it back and drawing it down alternately, endeavoring to impress a slight rotation on it each time, as certain accoucheurs have recommended; for that would very often be impossible, and, besides, by being carried too far, it would wring the child's neck; for the head, being held by the contraction of the fundus uteri, might not participate in the rotation impressed on the trunk. It is much better, therefore, to renounce it altogether and permit the face to come above.

Inhalations of chloroform have been recommended by some persons as possessing the immense advantage of quieting these spasmodic contractions of the uterus, and of rendering versions easy, which were previously impossible. I have no personal experience in this matter, but upon interrogating that of others, I find that they have obtained very different results. Thus, whilst M. Stoltz thought that he had remarked an increase in the frequency and force of the contractions, and Mr. Murphy states that he had never before met with so much difficulty in a case of turning, although the patient *was completely under the influence of the chloroform*, we find Dr. Denham affirming that in ten cases in which chloroform had been administered previous to the version, its use had facilitated the operation, and that its happy influence was especially remarked in the case of a woman in whom the introduction of the hand, though attempted fruitlessly before the inhalation, was effected with the greatest ease immediately afterward.

The facts as yet known are too contradictory to enable us to judge of the efficacy of chloroform in these cases. For even in those in which its use was followed by a relaxation of the uterus, is it certain that this occurrence, which often takes place spontaneously and suddenly, was anything more than a simple coincidence? There seems some reason for thinking so, when we recollect the cases in which it produced no effect. It is, therefore, an undecided question. However, I should hasten to add, that Mr. Simpson, and other most conscientious men, admit that the inhalation of chloroform must be pushed to its fullest extent, and be continued for a long time, before it affects the muscles of organic life. Mr. Simpson attributes the suspension of normal labor to the abuse and excess of inhalation. If such be the case, is it not reasonable to suppose that it would be necessary to carry the use of chloroform beyond the limits of prudence, in order to terminate the abnormal and almost tetanic contractions, and then is there not cause to fear the occurrence of one of those terrible misfortunes which some surgeons have had to deplore?

E. *Mobility of the Body of the Uterus.*—According to M. P. Dubois, sufficient stress has not been laid upon this difficulty; because, if unattended to, it may absolutely prevent the introduction of the hand as far as the fundus uteri. That is, the hand, being wedged in between the uterine and fœtal surfaces, attempts in vain to get at the feet, since the womb, the hand, and the trunk of the child then form a whole which turns on itself, but the hand does not progress into the interior of the uterine cavity. To remedy this obstacle, it is only necessary to have the fundus of the organ kept steady, by directing an assistant to place both hands over its superior and lateral parts.

F. *Shortness of the Cord.*—Whatever be the cause, the cord when very short may become stretched, during the tractions on the pelvic extremity, and even to such an extent as to occasion its rupture. This accident is to be prevented by cutting the cord, when the tractions made on its placental portion are not sufficient to relax it.

G. *Large Shoulders.*—As the loins become free at the vulva, the shoulders engage at the superior strait; when it happens, in certain cases, that the tractions, which up to that time had been efficacious, cease to be so any longer, and some resistance is experienced in completing the delivery. This resistance is dependent solely on the fact that the bis-acromial diameter of the shoulders corresponds to the diameter of the superior strait; and consequently, from its width, encounters some difficulty in clearing the latter. But this is easily relieved by imparting some oblique movements to the portions of the child already disengaged, which carry the breech successively towards the groin of one side, and the sacro-sciatic ligament of the opposite side; whereby the bis-acromial diameter is inclined, and its two extremities are made to engage in the excavation one after the other.

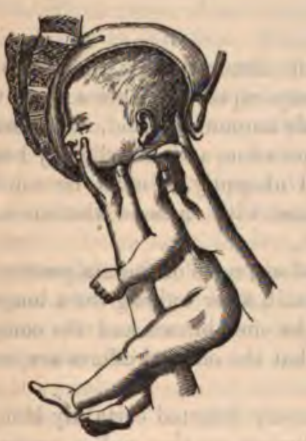
H. *Crossing of the Arms behind the Neck.*—It sometimes happens that one of the arms (ordinarily the sub-pubic one) is found crossed behind the neck, when about to be delivered. We have advised that an attempt be made to bring the child's posterior plane around in front; but in order to accomplish this, it is necessary to make the trunk undergo a considerable revolution, during which the arms, that are not involved in the movement, might be displaced by rubbing against the womb, and thus become crossed between the neck and the posterior face of the symphysis pubis. It is portant to bear in mind that, according to the observation of Dugès, this crossing of the arms may take place in two ways: namely, they may be crossed behind the neck, after having been first raised up on the sides of the head, and then the overlapping is effected from above downwards and from before backwards, relatively to the fœtus; or it may occur from below upwards, the arms then mounting up along the child's posterior plane, and becoming placed under the occiput. This latter circumstance may be produced in the following way: as the arms are usually located on the sides of the thorax, they may not participate in the movement of rotation impressed on the trunk, in making an attempt to bring the anterior plane of the fœtus towards the mother's loins; and, consequently, one or both of them may thenceforth be found placed on the child's dorsal plane. Then, supposing the tractions on the breech are continued, the arm will become arrested against the symphysis pubis, while the trunk descends or is extracted, in such a way as to be still there when the back of the neck reaches that point. These two cases can be distinguished from each other by remarking that, when the crossing of the arms has taken place from above downwards, and from before backwards, the inferior angle of the scapula is removed to a considerable distance from the median line of the spine; while, on the contrary, it will be quite close to it when the crossing has occurred from below upward along the back of the fœtus. The diagnosis is important, since the disengagement of the crossed arms evidently cannot be effected in the same manner in both cases; because, as a general rule, the arm has to be brought down in an opposite direction to the course it followed in becoming displaced. Thus, in the latter case, it must be made to descend along the back, by hooking the elbow with one or two fingers; in the former, it will be first brought over the occiput, and then down along the side of the head, face, and sternum. This latter disengagement is sometimes exceedingly difficult, for the occiput, being strongly pressed against the symphysis, seldom leaves free space enough between it and the os pubis for the operation. When this occurs, it has been recommended to press up the chest forcibly, with a view of making the occiput go upwards, and thereby releasing the arm. It would certainly be better, after having disengaged the posterior arm, to impress a movement of rotation on the whole trunk and head of the fœtus, on its longitudinal axis, which would carry the occiput and the arm to be disengaged into the hollow of the sacrum.

1. *Arrest of the Head.*—Both contraction of the pelvis and extension of the head may render difficult the delivery of the cephalic extremity. But as we have already pointed out what is proper to be done in the former case, we need not revert thereto again.

When the expulsion of the fœtus is left to the powers of nature, the head descends, moderately flexed, into the excavation, and most generally its disengagement presents no marked difficulty. But when it becomes extended in consequence of improper tractions on the breech, its long diameters are brought into correspondence with the diameters of the pelvis, and its further delivery is thereby rendered impossible. Of course, in this state of extension, the occiput may either be found in front, (though this seldom happens,) or it may be found behind, the face being above, which is by far the most common.[1]

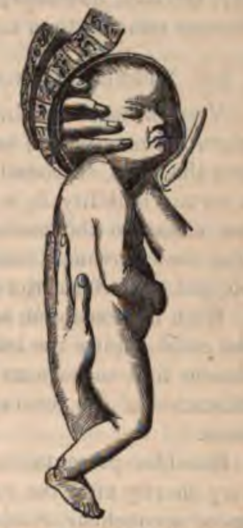
When the occiput is in front, the flexion of the head is effected without trouble; for it is generally sufficient to place two fingers on the sides of the nose, or else on the lower jaw inside of the mouth, and then depress the chin by a moderate traction on this part; whilst two fingers of the other hand are passed in under the symphysis and implanted on the occiput, so as to press up the latter above the superior strait. (Fig. 125.) When this manœuvre does not prove successful, it has been recommended, before having recourse to the forceps, to introduce the hand into the hollow of the sacrum and grasp the face with its palmar concavity, in order to bring down the head into its normal position by effecting a forced flexion.

FIG. 125.



Mode of flexing the head by drawing down the chin and pushing up the occiput.

FIG. 126.



Mode of rotating the face into the hollow of the sacrum.

When the occiput is behind, and its delivery is not possible, either by flexion or extension, (see Fig. 126,) it is advisable, says Madame Lachapelle, to change the position of the head and carry the face back into the hollow of the sacrum; and, for that purpose, to introduce that hand into the sacral concavity whose palm would embrace the occiput more easily; (the right, when the face is a little to the right, at the same time that it is in front; the left, when it is somewhat to the left; though, if the face were entirely above the pubic symphysis, the choice of the hand would be a matter of indifference;) then the fingers, after having passed behind the head, are slipped over one side of it, and pushed forward as far as the mouth, by gliding along the nearest cheek (Fig. 126). The hand is then forcibly inclined on its cubital border, having the palmar surface in front; next, it draws the parts on which the extremity of the fingers is applied, that is to say, the face, downwards and backwards towards the coccyx, when nothing further remains than to flex the head and extract it as in ordinary cases.

---

[1] The extension of the head, during version, is far more common in those cases where the occiput is turned towards the sacrum. The reason of which will be readily understood by giving attention to the following circumstances, namely: the tractions are naturally made downwards and forwards, while the os uteri, which has a constant tendency to retract, is directed somewhat downwards and backwards; whence it results that the anterior lip of the womb presses strongly on that portion of the child which is turned towards the pubis. Consequently, when the occiput is in front, the ance offered by this lip has a tendency to flex the head still more; but, on the co when it is behind, the chin is almost inevitably caught by the anterior lip, a head is thereby extended.

§ 5. Appreciation of Version.

Version, when performed under favorable circumstances, that is to say, when the membranes are intact, or have been ruptured within a short time, and the child, surrounded by a considerable amount of fluid, still possesses a certain mobility, is, in general, an easy operation, and but slightly hazardous either to the mother or the fœtus. Unhappily, it must be confessed that these fortunate conditions are rarely met with in cases wherein we are obliged to perform the operation.

With the exception of shoulder presentations, none of the malpositions of the child require the intervention of art, until, after waiting for a longer or shorter time subsequent to the rupture of the membranes and the complete dilatation of the cervix, it is ascertained that the natural efforts are insufficient.

Shoulder presentations themselves are rarely detected certainly before or very shortly after the rupture of the membranes, so that unless an experienced accoucheur should have attended the woman from the commencement of the labor, he is not called in consultation until after the waters have been discharged for a long time. It is, therefore, mostly necessary to act under unfavorable circumstances. Now, it should not be forgotten that the requisite manœuvres, which are serious as regards the maternal organs, are especially fatal to the child. Whilst pelvic version proves fatal to one woman out of 10·4 according to Riecke, and to one out of 11·4 according to Hüter, the mortality of the children is very much greater. Thus, the statistics of Madame Lachapelle represent the loss of one child out of 3·96, and those of Carus, Osiander, Michaelis, and Kiwisch more than one-half; whilst Hüter states the mortality at two-thirds. This mortality of the children is truly frightful, and yet, considering the accidents which, in certain of the cases, necessitated the version, and which of themselves destroyed the fœtus, I think that these results are correct, so far as the influence of the mere operation is concerned. I have often heard the venerable Capuron say, that in difficult cases, two-thirds, and perhaps even three-fourths of the children perished; and the results of my own practice correspond fully with his observation. Churchill, who states 542 cases of version, gives a mortality of 1 in 3 for the children, and 1 in 15 for the mothers. It is true, that he makes no distinction between difficult cases and others.

The above-mentioned difficulties, which, unfortunately, are very common, explain sufficiently this result. With experience, and especially with great care, it is always possible to overcome them, and, at the same time, spare the mother the grave lesions of the vagina and of the body and neck of the uterus which an unpractised and brutal hand often occasions; but we cannot always prevent the violently contracted organ from being exceedingly irritated by the forcible introduction of the hand, nor the irritation from becoming the starting-point of puerperal inflammations, nor the physical and moral shock to the patient from being so great as to terminate her existence.

It is only necessary to have followed the manœuvre in difficult cases to understand the dangers to which the fœtus is exposed. Throughout the operation, the umbilical cord is liable to be compressed more or less severely, and the efforts required to disengage the upper and lower extremities, expose them greatly to fracture. Finally, the tractions exerted upon the pelvic extremity, whenever an obstacle prevents a ready engagement of the head, may very easily give rise to lesions of the upper part of the neck and the medulla oblongata incompatible with the regular establishment of extra-uterine respiration.

It is very difficult, from an examination of the published statistics, to form an exact idea of the frequency of the cases in which version may be required. These cases, in fact, are not the same in all countries, nor for every accoucheur in the same country. Besides, as the statistics were for the most part collected in hospitals, it is evident that we would have a very incorrect proportion by deciding upon a mean from the figure of the versions performed in any one institution, because this figure represents not only the versions required by the patients already admitted into the establishment, but also the difficult cases brought there at the last moment from the city.

The following *resumé*, to which, however, I attach but a very secondary importance, will at least serve to show the differences in the statistics according to localities. Thus, whilst in England but 145 cases of version are mentioned for 39,539 deliveries, or 1 in 269, the French practice gives 400 versions for 37,479, or 1 in 93½, and the Germans have performed it 337 times in 21,516, that is to say, in one case in 63⅔.

§ 6. OF VERSION IN VERTEX, FACE, BREECH, AND TRUNK PRESENTATIONS.

After the minute detail into which we have just entered in describing the general precepts that are applicable to all cases of version, it will only be necessary to point out the peculiarities attending this operation in each of the ten positions admitted by us.

Presentation of the Vertex.—Whenever the vertex presents, the child will be placed in such a way that its occiput is directed either towards one of the points on the right lateral half, or towards one on the left lateral half of the pelvis; that is, either in the left or the right occipito-iliac position.

1. *Left Occipito-Iliac Position.*—In conformity with the precepts above given, we would here introduce the left hand; which, after having reached the os uteri, is to grasp the head in such a manner that the palmar face of the four fingers shall be applied on its posterior (left) side, and the thumb on its anterior one, the sinciput being lodged in the palmar concavity. Then, during the interval between the pains, the head must be pressed up

towards the left iliac fossa; after which, the thumb is brought alongside of the index, and the hand is passed successively along the left side of the head and neck, and behind the shoulder and elbow; in a word, it is made to traverse the whole left lateral plane of the fœtus down to the breech. While this movement is being effected, it is advisable to keep the head in the iliac fossa where it was originally placed, by constantly pushing it up, first with the thenar eminence of the hand, and afterwards with the front surface of the forearm. Having gained the nates, the hand, which up to that time had been kept in a state bordering on supination, is changed into one of pronation, in order to pass around the breech; when it descends on the posterior aspect of the lower extremities, extends the legs, and reaches the feet, which it seizes as firmly as possible. Or, as stated above, we might guide the hand along the anterior plane of the fœtus, and thus get directly at the feet. (Fig. 120.)

In drawing down the feet, we must be careful to curve the child's trunk in the line of its natural flexure; whilst the other hand, placed over the left iliac fossa, pushes the head towards the fundus uteri, and thus facilitates the evolution of the fœtus. This evolution being once effected, the left occipito-iliac position is found to be converted into a right lumbo-iliac one. The subsequent progress of the delivery offers no special indication.

2. *Right Occipito-Iliac Position.*—In this case, the right hand would be chosen in preference, by which the head is to be grasped, as in the preceding case, and then to be pushed up towards the right iliac fossa; the hand traverses the right lateral or posterior plane of the fœtus, and after having seized the feet converts the second position of the vertex into a first of the breech, or, in other words, into a left lumbo-iliac one.

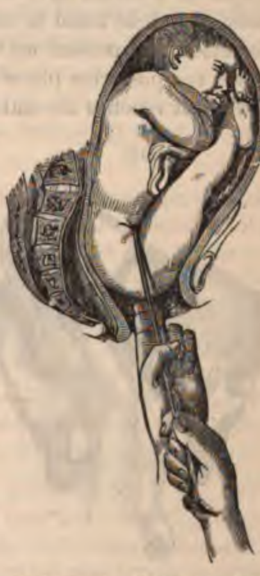
The rapidity with which the extraction is to be effected must depend upon the gravity of the accident which has rendered it necessary.

Presentations of the Face.—In the face presentations, we use the left hand in the right mento-iliac, and the right one in the left mento-iliac positions. The four fingers are to be applied on the posterior cheek, the thumb on the anterior one, and the face will be lodged in the palmar concavity; the head, after having been pushed above the superior strait, will be carried if possible towards the left iliac fossa in the right mento-iliac, and towards the right iliac fossa in the left mento-iliac positions; and then the evolution will convert the former of these positions into a right lumbo-iliac, and the latter into a left lumbo-iliac position.

Presentations of the Pelvic Extremity.—When the pelvic extremity presents, and any circumstance whatever demands a prompt termination of the labor, it is not, properly speaking, a version that the accoucheur has to practise, but rather a few simple tractions on the presenting part.

If the feet or the knees offer at the uterine orifice, or hang in the vagina, the accoucheur merely seizes and draws on them, conforming to the rules above given; but where the lower extremities are stretched out along the child's anterior plane, and the breech alone presents, the course to be pursued varies a little, according as this part is more or less engaged in the excavation. Thus, when the nates are still above the superior strait, or at least are so little engaged that it is easy to press them up, we must act in the following manner: taking care to introduce the left hand in the left lumbo-iliac positions, and the right hand in the opposite ones, the buttocks are first seized by the whole hand, and gently pushed up into that iliac fossa towards which the child's back is turned; then the feet are sought out, by following the posterior aspect of the lower extremities, and they are brought down so as to draw upon them and terminate the third stage of the version. When the nates have reached the pelvic floor, the index finger of one hand is placed in the posterior groin, and the same finger of the other hand in the anterior one, and then, having both fingers curved like a hook, we draw on the buttocks until the feet are entirely clear. Lastly, if the breech is so far engaged as to be no longer capable of being pressed above the superior strait, and, nevertheless, has not yet descended low enough to be caught by the fingers, a blunt hook is employed, which is to be applied from without inwards on the anterior groin, if it is possible to make it slip up between the anterior hip and the symphysis pubis (Fig. 127); in the contrary case, it is passed between the two thighs, and made to penetrate from within outwards on the internal part of the limb; but in this latter case it is necessary to protect the genital parts, the scrotum in particular, by one or more fingers previously introduced, lest they become embraced by the concavity of the instrument. (See also *Forceps.*)

FIG. 127.



Mode of using the blunt hook in breech positions.

Presentations of the Trunk.—We have frequently repeated that the trunk presentations, of themselves, require the intervention of art; and that it is requisite to change the position of the child as soon as the conditions necessary to this evolution are met with. In the preceding article we endeavored to point out those conditions under which we think an attempt to effect the cephalic version ought to be recommended; notwithstanding which, the pelvic version is very often practised, either because such attempts have proved ineffectual or because it is deemed advisable not to resort to them.

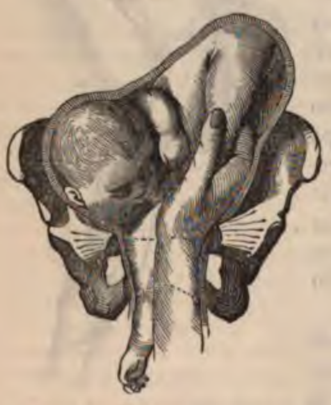
Nevertheless, before laying down the rules of the operation, we must remark that the accoucheur only resorts to pelvic version in these cases in order to remedy the defective presentation; and consequently that, as soon as he shall have converted this latter into one of the breech, he should abandon the rest of the labor to the expulsory efforts of the uterus, unless some accident, serious enough to threaten the life of either the mother or the child, should require a more rapid delivery. As before stated, the trunk presentations are two in number, and each side of the fœtus may present at the superior strait in two different positions: in the first of each, the head is in the left iliac fossa, and in the second it is in the right iliac fossa.

The rule heretofore followed in the choice of the hand is not applicable to the trunk presentations; for here we would introduce the right hand in the positions of the right lateral plane, and the left in the positions of the left lateral plane; after which the operation is conducted in the following manner:

A. *First Position of the Right Shoulder* (left cephalo-iliac).—The right hand is to be introduced into the parts in a state of supination, when, after having endeavored to push the shoulder above the superior strait, and a little towards the left iliac fossa, it is directed towards the right sacro-iliac symphysis, above which the child's feet are found; the latter will then be seized and brought down into the vagina. In doing this, it is not necessary to bend the fœtus in the line of its natural flexure, as in the vertex and face positions, but we may draw immediately on the feet and bring them into the excavation; for this lateral evolution, or bending on the side, is much more speedily accomplished, and is not attended with any inconvenience. The feet being once in the vagina, the operation is terminated as in all other cases.

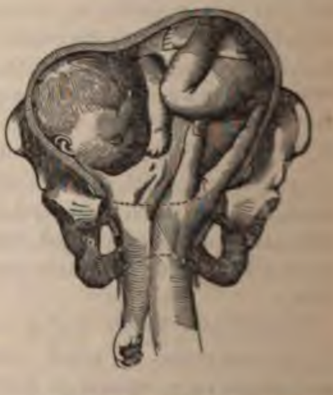
B. *Second Position of the Right Shoulder* (right cephalo-iliac).—Here, likewise, the right hand is introduced in a state of supination. The shoulder is seized and pushed up towards the right iliac fossa, and then the hand traverses the posterior plane of the fœtus, by passing backwards and to the left; when it reaches the nates, it gets around them by being changed into a state of pronation, and then comes forward and to the left to grasp the feet, which are next brought down into the vagina. (Fig. 129).

FIG. 128.



The introduction of the hand in the second position of the right shoulder.

FIG. 129.

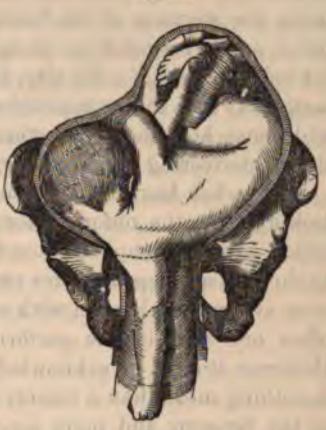


Mode of seizing the feet in the same position.

C. *First Position of the Left Shoulder* (left cephalo-iliac).—The left hand is introduced in a state of supination, and then, after pressing the shoulder upwards and a little to the left, it is directed along the child's back towards the right posterior part of the pelvis, where it is passed around the breech by turning to a state of pronation, and is next brought forward and to the right, so as to seize the feet.

D. *Second Position of the Left Shoulder* (right cephalo-iliac.)—The left hand, introduced in a state of supination, pushes the shoulder above the superior strait and somewhat to the right; and then, passing towards the left side and posterior part of the uterus, it goes in search of the feet, which are found there.[1]

FIG. 130.



Mode of seizing the feet in the second position of the left shoulder.

Trunk Presentations with a Descent of the Arm. (Presentations of the arm or hand, of authors.)—We have heretofore stated that the descent of the hand in the shoulder presentations is nothing more than an attendant circumstance of these latter. Consequently, whether the hand has been carried along by the gush of waters which escaped when the membranes were ruptured, or whether it has been drawn down by the accoucheur himself, in order to make out the diagnosis, it constitutes an obstacle of minor importance, and even one which may render the pelvic version more easy; hence, so far from attempting to push back the arm into the uterus, we ought to apply a fillet on the wrist, not for the purpose of drawing upon the latter, but to prevent it from returning whilst searching after the feet in the ordinary way.

---

[1] As the reader will see, this operation is very simple; though it must be acknowledged, however, that, in those cases in which the dorsal plane of the fœtus is directed forwards, it renders this plane liable to be turned backwards after the evolution of the child. Consequently, when we cannot succeed in turning the belly posteriorly during the traction, it gives rise to all the inconveniences hitherto pointed out as occurring in those instances in which the face looks toward the pubis.

In order to remedy these difficulties and their attendant dangers, M. Velpeau recommends that the positions in which the back is in front (the first of the right shoulder, and the second of the left) be converted into the dorso-posterior positions before attempting the evolution. Thus, he would endeavor to convert a second position of the left shoulder into a first of the left, by making the head pass above the pubis or above the promontory of the sacrum, according to whether it was originally placed nearer to the anterior arch of the pelvis, or to the right sacro-iliac symphysis; he would then terminate it, as if it had primitively been a first position of the left shoulder. "Should the membranes have been long ruptured," adds M. Velpeau, "the womb strongly contracted, and the child not to be moved but with very great difficulty, there is a third manœuvre that ought then to be preferred; it consists in pushing the shoulder up with the right hand from behind forwards, as if to make the spine turn upon its own axis; then trying to reach the right side by passing along the front of the chest, while the womb is forcibly pushed backwards with the left hand; lastly, in taking hold of the feet, the right one first, so as to bring them down in the first position."—*Meigs' Translation*, p. 447.

We have alluded to this manœuvre, only because the author's name might give it some importance in the eyes of young practitioners. But in our estimation it ought to be rejected altogether. In fact, one of two things must then happen; for either

"Our object in applying this fillet," says Madame Lachapelle, "is to keep the hand at the exterior, lest the arm should take a wrong direction; as also lest, being stretched out as it is, it will not follow the rotation that turns the sternum of the fœtus posteriorly, when, by being arrested by the pubis, and by ascending along the child's back, it might become crossed behind the neck." Finally, let us add, that the hand, or rather the arm, materially aids in accomplishing the rotation of the trunk, since it offers an additional hold for the tractions made on the body, and obviates the necessity of delivering one shoulder, which is very often painful.

After what has just been said, the reader will doubtless be astonished in looking over the older writers, to observe the alarm occasioned by the so-called presentation *of the hand* or *arm*, and he will be still more surprised at the barbarous procedures employed by them for its management. They were evidently mistaken with regard to the cause of the difficulties that are often met with in the performance of version under such circumstances. However, it must be acknowledged that, although a *presentation of the hand* is nothing more than a variety of the shoulder presentation, yet the descent of the forearm, and more especially of the arm, beyond the vulva, constitutes an exceedingly unfavorable complication. Because, where this hangs down at the exterior, or nearly so, it must necessarily happen that the presenting shoulder is already forcibly engaged in the excavation; an engagement that can only take place when the whole of the waters have been discharged for some time, when the uterine contractions have been exerted for a long while on the body of the child, and when the walls of the womb have become firmly retracted on the surface of the fœtus. Moreover, the prolonged contact of the fœtal inequalities is then very apt to bring on spasmodic or tetanic contractions of the body and the neck of the uterus, which are justly considered as constituting one of the most serious complications; for they equally prevent the return of the presenting part, the introduction of the hand, and the evolution of the fœtus.

Consequently, we are not to operate on the part that may present in these difficult cases; for a return of the arm into the uterine cavity is then impossible, and of little service; to draw on it strongly, under a hope of engaging the doubled-up trunk in the excavation, and of making it perform a kind of artificial evolution, is to commence a manœuvre that cannot be carried through, and which must greatly augment the existing difficulties; to go in search of the other arm, so as to subsequently pull upon it with a view of making the descended shoulder return, presupposes an introduction

---

the uterus is forcibly retracted (when this conversion, if persisted in, appears to us impracticable and dangerous), or else the womb is inert, and it would therefore be useless. As we have already stated, the reason for dreading a persistence of the child's anterior plane in front, is not because it cannot be turned backwards during the traction, but because there is reason to fear lest the head, by being arrested by the contraction at the fundus of the uterus, may not follow the movement of rotation impressed on the thorax, whereby a torsion of the neck might result. Again, if the organ is inert enough to admit of the preliminary conversion advised by Velpeau, it would doubtless be sufficiently so to enable the accoucheur to direct his tractions in such a way as to bring the occiput in front, and the face into the hollow of the sacrum, without hazard.

of the hand, which would be almost as difficult as searching after the feet; and, lastly, to scarify the arm or amputate it, is a barbarous measure when the child is living, and generally useless when it is dead.

We repeat, it is not there that the genuine obstacles to the delivery are to be found; but it is rather against the violent contraction of the body and occasionally of the neck of the womb, that we are to act, by employing the measures recommended above. Should these fail, the course to be pursued will necessarily vary, according to whether the fœtus be living or dead. If still living, and the mother's condition does not absolutely demand a prompt delivery, we should hope, and wait for a spontaneous evolution. (See *Natural Labor.*) But if her life is seriously compromised, though the child be yet alive, its viability may be considered as destroyed, and embryotomy be resorted to. (See *Embryotomy.*) The reasons for this course will be still more urgent when there is a certainty of its death.

CHAPTER IV.

OF THE FORCEPS.

THE forceps is a kind of pincers composed of two blades, very similar to each other, and which are specially intended to be applied on the head of the fœtus.

The honor of inventing this instrument has been attributed to several persons; but, at the present day, it is clearly established that the forceps was invented by a member of the family of the Chamberlens, who, during the first half of the seventeenth century, pursued the censurable course of holding it as a secret, by the aid of which they promised to terminate the most difficult labors. It would appear, however, that it soon became known to some of the English practitioners; for Drinkwater, who practised the art of midwifery from 1668 to 1728, made use of instruments which, if we may judge from the description given of them by Johnson, closely resembled those employed by the Chamberlens.

In 1670, one of the Chamberlens came to Paris for the purpose of selling his secret; since, according to the account of Mauriceau, he had proposed to the king's chief physician to make known his instrument for a remuneration of ten thousand crowns. As Chamberlen believed his process was applicable to all cases, he unfortunately promised to effect delivery in a woman whose pelvis was deformed to an extreme degree, and on whom Mauriceau had deemed the Cæsarean operation to be necessary. Consequently, as the French accoucheur had foreseen, all the attempts of Chamberlen to accomplish the delivery proved ineffectual, and he returned to England, abandoning all the glittering hopes of fortune that he had expected to realize on arriving at Paris. It would seem that he afterwards made a journey to Holland, about the year 1693, and communicated, or rather sold, some of his instruments to certain accoucheurs there, among whom Roonhuysen, Ruysch, and Bockelman are particularly mentioned.

In fact, it is almost certain that the famous lever of the former of these physicians had no other origin, and was only a slight and defective modification of the instrument he obtained from Chamberlen. However this may be, the forceps was likewise held as a secret for a long time in Holland, and it was not until sixty years afterwards, that is, about the year 1753, that Visscher and Van de Poll brought Roonhuysen's lever into general notice.[1]

Palfyn, an accoucheur of Ghent, has also been incorrectly considered as the real inventor of the forceps. He made several trips to London and Germany, with a view of finding out this wonderful secret; which, according to Mauriceau, had furnished Chamberlen an income of more than thirty thousand livres per annum (an enormous sum for that period); and it is probable that it was in consequence of the information obtained in these two countries, that he designed the instrument for drawing upon the head (*tire-tête*), subsequently presented by him to the Academy of Sciences at Paris.[2]

Chamberlen's forceps underwent a number of modifications after it became public property, that were generally unimportant; and fortunate indeed was it when the so-called improvements did not render it more awkward and dangerous than before. But the middle of the eighteenth century opened a new era in the history of this instrument; for, about this period, two illustrious obstetricians, Levret in France, and Smellie in England, were struck with the necessity of accommodating the shape of the forceps to the direction and form of the pelvic axis; and, as a consequence, they thus enlarged the field of its application. Chamberlen's forceps was straight, and therefore only applicable when the head was low down in the excavation, and close to the perineum; but both of these gentlemen endeavored to render it capable of being applied to the head when still above the superior strait; and for that purpose they gave it a curve in the direction of its long axis, so that the anterior border presented a concavity and the posterior one a convexity.

---

[1] We may remark that the instrument described by these last-named authors, under the title of Roonhuysen's lever, was not the one which the latter had bought of Chamberlen, for it is composed of a single curved iron blade. In 1747, Rathlauw published a description of an instrument that he had received from Van der Swam, a pupil of Roonhuysen, which was composed of two blades, having fenestræ in them, and joined at their extremity by means of a pin.

[2] This presentation, made at a time when Chamberlen's forceps were scarcely known in France, unjustly obtained for Palfyn the reputation of being its inventor. But, in our day, the question can no longer be considered doubtful, for, independently of the numberless proofs that establish the claims of the Chamberlens, they have recently been confirmed, says Dr. Edward Rigby, by a discovery made in the county of Essex. It appears that Dr. Peter Chamberlen purchased, towards the end of the seventeenth century, the estate of Woodham, Mortimer Hall, near Maldon, in Essex, which continued in the family till about 1715, and was then sold to Mr. Wm. Alexander, who bequeathed it to the Wine Coopers' Company. About the year 1815, the tenant in occupation discovered, in the floor in the uppermost of a series of closets, which are built over the entrance-porch, a trap-door. In the space between the flooring of this closet and the ceiling below were found, among a number of empty boxes, a cabinet containing a collection of old coins, divers trinkets, many letters from Dr. Chamberlen to different members of his family, and some obstetric instruments. These instruments, which were given to Mr. Carwardine by the lady of the mansion, and described by Rigby, exhibit the successive attempts made by the Chamberlens, before they succeeded in perfecting their forceps.

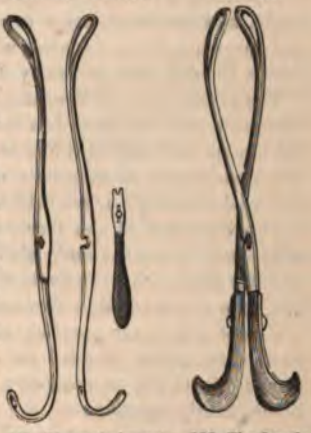
It is impossible to ascertain which of the two had the priority in originating this important modification of the forceps; for, though it is certain that Levret had such a curved instrument in 1747, and that Smellie did not announce his until 1751, yet the latter expressly declares that he had invented it several years previously; however, as his invention had not been made public, the merit of priority belongs to Levret.

Hundreds of modifications have been proposed since the days of Levret and Smellie, nearly all of which have fallen into oblivion; some of them were quite ingenious, but they imperfectly attained the end their authors had in view; and others were really destitute of value or utility. Consequently, we shall restrict what we had intended to say concerning its history to these few lines, and shall only describe the forceps now generally used throughout France, which is none other than that of Levret, very slightly modified.

The forceps is composed of two branches, each of which may be divided into three parts, namely: the blade, the handle, and the point of junction, or the lock. The blade is intended to be introduced into the mother's parts, so as to embrace the head of the fœtus; presenting, therefore:

1. A curvature on its flattened aspect, the internal concavity of which is destined to be applied to the side of the fœtal head, while its external convexity slips along the concave walls of the pelvis. 2. A curve on its edge, having the concavity anteriorly, which is made for the purpose of accommodating the form of the instrument to the direction of the pelvic axis; and to render an application of the forceps practicable even when the head is retained above the superior strait. The blade is usually provided with a fenestra, which serves to diminish the size and weight of the instrument, and has the further advantage of permitting the parietal protuberances to engage in the void thereby produced, which engagement compensates, to a certain extent, for the thickness of the branches. The old forceps were provided with a kind of bead around the periphery, and the internal face of the blades, which was made quite prominent, was intended to obvitate the slipping of the head. But the contusions of the scalp, produced by this raised border, have led to its removal, and those now in use have the inner surface of the blades polished down with a file. Both handles of the instrument are usually bent to a slight degree at their extremity, in the form of a hook. One of them is much more curved than its fellow, and has, near its end, a hollow button, which unscrews and serves for the lodgment of a sharp hook, while the curve of the other scarcely reaches a right angle, so that we find the forceps, a blunt and a sharp hook, included in the same instrument. The handles and blades are just alike on both branches, which

Fig. 131. Fig. 132. Fig. 133.



131. The male branch. 132. The female branch. 133. The forceps locked.

differ from each other only at their middle or articular part, where one of them is provided with a pivot and the other with a mortise, made either in the middle or on the side of the instrument, by means of which they can be firmly locked after their application. The branch bearing the pivot has received the name of the *male* (Fig. 131), and the other, having the mortise, that of the *female* branch, or blade (Fig. 132). The delicacy of certain accoucheurs has been shocked by these denominations, and they have endeavored to substitute for them the titles of the *left* and the *right* blades; but I cannot understand why the old names of the *pivot blade* and the *mortise blade* should not be retained; though I would willingly accept those of the left and the right ones if it were clearly understood which ought to be called the left and which the right. But unfortunately such is not the fact, for M. Velpeau designates that blade as the right one which Madame Lachapelle has called the left, and *vice versâ*. This discrepancy of terms creates great confusion in the mind of the reader, which we shall endeavor to avoid by retaining the names of the *male* and the *female* blades.

[Of all the parts of the forceps, the articulation has, perhaps, been the most frequently altered. In Levret's instrument the mortise is placed lengthwise in the centre of the female blade. In the articulation, the female blade has to be raised, in order to allow the pivot to pass through the mortise, when a turn of the pivot makes all secure. If the fingers are unable to turn it, a key made for the purpose may be used. (See Fig. 132.)

In Siebold's forceps, the place for the pivot is a notch in the side of the female blade, and the articulation is effected by simply bringing the two blades together and screwing down the pivot after it has entered the notch. This kind of articulation is the one now generally used.

The articulation of Brunninghausen's forceps resembles the preceding, with the exception that the pivot is a simple pin, which enters the lateral notch and holds the blades with sufficient firmness when the attempt is made to bring them together. The articulation of Smellie's instrument is effected by a sort of interlocking, the left blade having a notch which receives the articular part of the right one.

The branches of the forceps just described cross each other, and can only be articulated when the male blade is below the female one, so as to allow the pivot to enter the notch. To avoid this inconvenience, which, after all, is not so great as has been represented, a forceps, described by Thenance in 1801, was invented, the blades of which are parallel and articulate at their ends by means of a hinge fastened with a pin; besides which, they are pierced at their centres with an oval opening intended to receive a band which secures the articulation by tying the blades firmly together.

The latter instrument is still much used in the middle of France, where it is known as the Lyonese forceps. Taking it as a model, my colleague, M. U. Trélat, had a forceps made of the same form, but of reduced size, and remarkable for the flexibility and elasticity of its blades.

The wish to avoid the uncrossing of the branches when the male blade happens to be placed above the female one, led Dr. Tarsitani to devise his instrument, the branches of which are crossed like Levret's forceps, whilst the pivot projects on either side of the male blade. It will be seen that this arrangement makes it a matter of indifference whether the female blade be above or below, and the articulation is as easy in one case as in the other. As, however, the branches were no longer parallel, it was necessary to break one of the branches and supply it with a hinge joint, which allows that handle to be depressed at will, in order to restore the parallelism.

The forceps, besides grasping the head of the child, subjects it to compression, and if the operator uses too much force, or presses the handles too strongly together, the compression may be dangerous. To avoid this risk, Petit had a stop put between the handles of his forceps, which limited the extent to which they could be closed, and measured, as it were, the degrees of pressure to which the head was subjected. Lauverjat, and other accoucheurs, devised similar arrangements, which from time to time have been resuscitated, and deserve, perhaps, to be added to our modern instruments. Doubtless, with the same idea, M. Mattei within a few years past invented an instrument to which he gave the name of *leniceps*. The blades resemble those of Levret's forceps, but the usual handles are cut off at the point of articulation, and their place supplied by a transverse one, which is furnished with notches at intervals, so arranged as to allow the blades to be separated or brought together. The chief advantage of this instrument is its transverse handle, which fits well the operator's hand, and prevents too great compression of the head. Its disadvantages are, that it affords a less secure hold than Levret's forceps; and as the degree of separation of the blades is predetermined by the notches of the handle, it is impossible to regulate exactly the application of the blades to the sides of the head. In this respect, those forceps are preferable which are provided with a movable stop or a screw, which allows the degree of approximation to be regulated at will.

In cases of contracted pelvis, the necessary application of the forceps to the sides of the cavity causes the head to be compressed laterally, and consequently lengthens it in the direction of the antero-posterior diameter. In order to avoid this inconvenience, Baumers (of Lyons) invented a forceps curved in such a way that one of the blades could be applied directly in front, behind the pubis, and the other directly back. It was with the same idea, doubtless, that Leake devised an additional branch to the common forceps, which was capable of being applied directly in front.

Within a few years past, Dr. Chassagny (of Lyons), and our colleague M. Joulin, Adjunct Professor to the Medical Faculty of Paris, conceived the idea that there might be an advantage in cases of difficult labor, in the substitution of an apparatus for producing steady traction, for the muscular effort of the accoucheur.

M. Chassagny's plan was, after applying his forceps, to attach one end of a cord to two hooks placed at the junction of the handles with the blades, the other end being fastened to the middle of a metallic bar placed in front of the woman's knees which gave it a fixed support. The cord being then drawn upon by means of a screw, brought away the forceps and child together. Chassagny's apparatus has the merit of priority, but has also the inconvenience of requiring a special addition to the forceps.

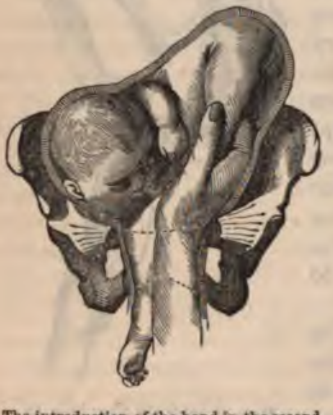
The principle of M. Joulin's instrument, which he calls an aid-forceps, is the same as that of M. Chassagny. It consists of a padded metallic bar, which is placed, not upon the knees, but against the woman's ischia, the thighs being moderately flexed. The common forceps are then applied, and a band being passed through the fenestræ, is attached to a drawing-screw with which the bar is provided. The traction made upon the band by turning the screw withdraws the forceps and head of the child. As the band passes through the fenestræ of the forceps, they have a direct tendency to approximate the blades with a force proportionate to the resistance, and thus increase the firmness of their hold. By means of a small dynamometer the force used is indicated in kilogrammes (a kilogramme, about two pounds), so that there is no occasion for exceeding the limits of a prudent intervention. Chassagny's and Joulin's instruments both act by effecting mechanical traction steadily and progressively applied, a form of power which had not before been utilized in obstetrical practice. The question now arises, Is this kind of force likely to be useful or injurious? It can only be replied at present, that, notwithstanding the laudable experiments of some accoucheurs at Lyons, nothing has the head is in the left iliac fossa, and in the second it is in the right iliac fossa.

The rule heretofore followed in the choice of the hand is not applicable to the trunk presentations; for here we would introduce the right hand in the positions of the right lateral plane, and the left in the positions of the left lateral plane; after which the operation is conducted in the following manner:

A. *First Position of the Right Shoulder* (left cephalo-iliac).—The right hand is to be introduced into the parts in a state of supination, when, after having endeavored to push the shoulder above the superior strait, and a little towards the left iliac fossa, it is directed towards the right sacro-iliac symphysis, above which the child's feet are found; the latter will then be seized and brought down into the vagina. In doing this, it is not necessary to bend the fœtus in the line of its natural flexure, as in the vertex and face positions, but we may draw immediately on the feet and bring them into the excavation; for this lateral evolution, or bending on the side, is much more speedily accomplished, and is not attended with any inconvenience. The feet being once in the vagina, the operation is terminated as in all other cases.

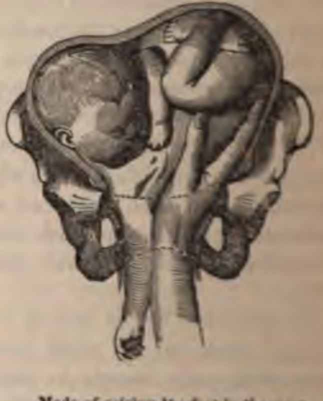
B. *Second Position of the Right Shoulder* (right cephalo-iliac).—Here, likewise, the right hand is introduced in a state of supination. The shoulder is seized and pushed up towards the right iliac fossa, and then the hand traverses the posterior plane of the fœtus, by passing backwards and to the left; when it reaches the nates, it gets around them by being changed into a state of pronation, and then comes forward and to the left to grasp the feet, which are next brought down into the vagina. (Fig. 129).

FIG. 128.



The introduction of the hand in the second position of the right shoulder.

FIG. 129.

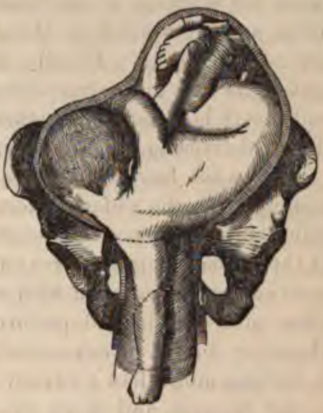


Mode of seizing the feet in the same position.

C. *First Position of the Left Shoulder* (left cephalo-iliac).—The left hand is introduced in a state of supination, and then, after pressing the shoulder upwards and a little to the left, it is directed along the child's back towards the right posterior part of the pelvis, where it is passed around the breech by turning to a state of pronation, and is next brought forward and to the right, so as to seize the feet.

D. *Second Position of the Left Shoulder* (right cephalo-iliac.)—The left hand, introduced in a state of supination, pushes the shoulder above the superior strait and somewhat to the right; and then, passing towards the left side and posterior part of the uterus, it goes in search of the feet, which are found there.[1]

FIG. 130.



Mode of seizing the feet in the second position of the left shoulder.

Trunk Presentations with a Descent of the Arm. (Presentations of the arm or hand, of authors.)—We have heretofore stated that the descent of the hand in the shoulder presentations is nothing more than an attendant circumstance of these latter. Consequently, whether the hand has been carried along by the gush of waters which escaped when the membranes were ruptured, or whether it has been drawn down by the accoucheur himself, in order to make out the diagnosis, it constitutes an obstacle of minor importance, and even one which may render the pelvic version more easy; hence, so far from attempting to push back the arm into the uterus, we ought to apply a fillet on the wrist, not for the purpose of drawing upon the latter, but to prevent it from returning whilst searching after the feet in the ordinary way.

---

[1] As the reader will see, this operation is very simple; though it must be acknowledged, however, that, in those cases in which the dorsal plane of the fœtus is directed forwards, it renders this plane liable to be turned backwards after the evolution of the child. Consequently, when we cannot succeed in turning the belly posteriorly during the traction, it gives rise to all the inconveniences hitherto pointed out as occurring in those instances in which the face looks toward the pubis.

In order to remedy these difficulties and their attendant dangers, M. Velpeau recommends that the positions in which the back is in front (the first of the right shoulder, and the second of the left) be converted into the dorso-posterior positions before attempting the evolution. Thus, he would endeavor to convert a second position of the left shoulder into a first of the left, by making the head pass above the pubis or above the promontory of the sacrum, according to whether it was originally placed nearer to the anterior arch of the pelvis, or to the right sacro-iliac symphysis; he would then terminate it, as if it had primitively been a first position of the left shoulder. "Should the membranes have been long ruptured," adds M. Velpeau, "the womb strongly contracted, and the child not to be moved but with very great difficulty, there is a third manœuvre that ought then to be preferred; it consists in pushing the shoulder up with the right hand from behind forwards, as if to make the spine turn upon its own axis; then trying to reach the right side by passing along the front of the chest, while the womb is forcibly pushed backwards with the left hand; lastly, in taking hold of the feet, the right one first, so as to bring them down in the first position."—*Meigs' Translation*, p. 447.

We have alluded to this manœuvre, only because the author's name might give it some importance in the eyes of young practitioners. But in our estimation it ought to be rejected altogether. In fact, one of two things must then happen; for either general rule, the breech presentations do not appear to me to warrant the use of the forceps. I am aware, however, that M. Stoltz recommends its employment under such circumstances, and I am induced to believe that M. P. Dubois would not hesitate in resorting thereto, in some cases where direct tractions on the pelvic extremity might be difficult.

2. *The blades should be applied as nearly as possible on the sides of the head, in such a way that the concavity of their margins shall be directed towards that part of the head which is to be brought under the symphysis pubis.*—This rule is not always feasible, for it will be seen hereafter that it is impossible to carry it out in some cases of transverse positions, in which we are obliged to seize the head over the forehead and occiput; but these exceptions are rare, and the operator should endeavor to follow the rule in all cases. When the forceps is thus applied, each blade bears on the lateral parts of the cranium; the parietal protuberances are found in the opening of the fenestræ, at the point where the blades are the most widely separated from each other; and the occipito-mental diameter corresponds very nearly to a line drawn from the extremity of the blades towards the pivot.

3. *As a general rule, the posterior blade ought to be introduced first.*—As the head is placed in a transverse or diagonal position in a vast majority of cases, one of its sides will look forwards and the other backwards, and, therefore, one of the blades will be at the fore and the other at the hinder part of the pelvis, since we have just seen that it is requisite to apply them on the sides of the head. Now it is the one that goes to the back part of the pelvis that we recommend to be generally introduced first. In theory, this is even admitted as the absolute rule, since it is considered to be the most generally applicable; for everybody acknowledges that the positions in which the occipito-frontal diameter corresponds to the left oblique one of the pelvis are the most frequent of all. But it must be borne in mind, that in practice there is no invariable law, and the one we lay down is subject to very numerous exceptions. If desirable, however, to establish a universal principle for the operation, we might say, that the blade, the application of which presents the greatest difficulty, ought to be introduced first. After all, it must be left to the skill and tact of the accoucheur to decide at the bedside of the patient which branch must be introduced first, for it is out of the question to anticipate, in a book, or even to imitate on the manikin, all the peculiarities that may there influence his decision. For instance, when the head is high up in the excavation, it would sometimes be better to reverse the rule, and introduce the anterior blade first.

4. *The male blade is always to be held in the left hand, and is to be applied at the left side of the pelvis; the female blade is to be held in the right hand, and is always to be applied at the right side of the pelvis.*

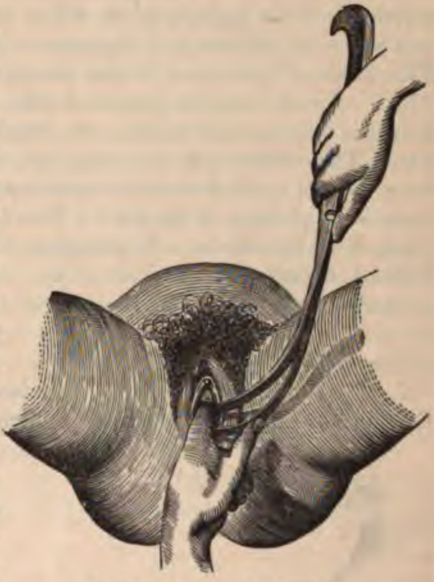
M. Hatin has lately suggested a method which bears considerable resemblance to that employed by Flamand in some exceptional cases. It consists in the introduction of both branches by the same hand. The left hand, preferably, is carried to the fundus of the uterus, or at least to the parts to which the forceps are to be applied. The first branch having been introduced along the hand which serves as a guide, the latter, without quitting the head of the fœtus, passes around it, and places itself on the opposite side, to receive and guide the second branch of the instrument.

This process, represented by M. Hatin to be the easiest, and especially the least dangerous for both mother and child, does not appear to me to possess all the advantages claimed for it by Flamand and M. Hatin. As M. Stoltz judiciously remarks, it can have no advantage except when the head is movable, or previously rendered so, above the superior strait, in which case we have already seen that pelvic version is preferable, even though the pelvis be slightly contracted.

When the head is wedged in the superior strait, or more or less engaged in the excavation, it seems to me that the ordinary process is incontestably superior.

5. *The free hand, or the one not engaged in holding the blade, should always be introduced first, so as to direct the latter.*—When the head is at the inferior strait, it is usually sufficient to insert two or three fingers between the side of the head and the pelvis (see Fig. 135); but whenever it is high up, the entire hand must be introduced into the vagina, taking the precaution to place the ends of the fingers between the head and the os uteri so as to be certain that the blade, by slipping along the palmar surface of the hand will get into the uterine cavity, and not pass externally to the cervix, perforate the cul-de-sac of the vagina, and penetrate into the peritoneum. The convex surface of the blades glides along the palmar surface, and the convex margin along the cubital border of the hand; in a word, this previous introduction of the latter is intended to protect the vaginal wall from the contact of the instrument.

FIG. 135.



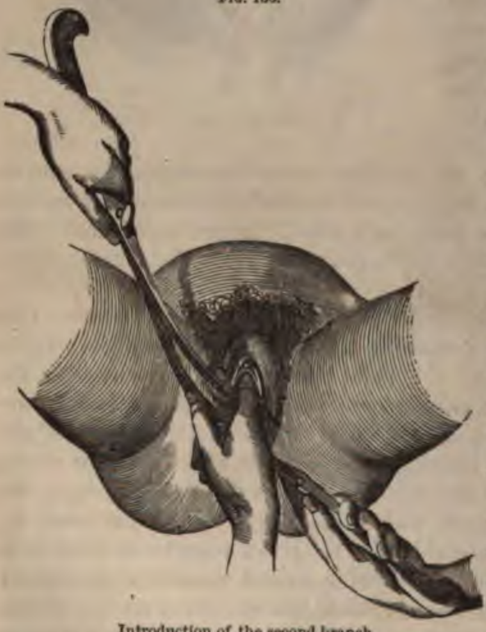
Introduction of the first branch.

6. *At what part of the pelvis should the blade be first introduced?*—This question has been variously answered: thus, Baudelocque directs it, in nearly all cases, immediately on the point where it is to remain after the locking. Levret (and M. Velpeau adopts nearly the same view) recommends that the two blades be introduced at the posterior quarter of the pelvis; that, in the diagonal positions, one of them be left in front of the sacro-iliac symphysis, but that the other be brought forward opposite to the cotyloid cavity which corresponds with the anterior side of the head, by making it traverse the whole lateral half of the pelvis from behind forwards. Lastly, Madame Lachapelle has proposed a mixed method, composed, in part, of both of the preceding: namely, both branches are first introduced in front of the sacro-sciatic ligament, and then the one which should remain posteriorly is pushed directly up to the sacro-iliac articulation; but the other

is brought forward at once opposite to the cotyloid cavity in the following manner: "I insinuate the extremity of the blade just in front of the sacro-sciatic ligament; then, as it passes in, I gradually depress the handle between the thighs, until it is inclined much below the level of the anus; by this manœuvre, the point of the blade is made to describe a spiral movement, which is directed and completed by the fingers introduced into the vagina. By this movement, the blade is carried upwards and forwards at the same time, so that it is made to pass around the head in an oblique direction, which would be represented by a line extending along the interior of the pelvis from the sacro-sciatic ligament to the horizontal branch of the pubis." This mode of procedure is also adopted by M. P. Dubois, and is the one which appears to us the easiest of all. It should be understood, however, that it is only applicable when the head is already engaged in the excavation. The reader will see, hereafter, that above the superior strait the branches are applied on the sides of the pelvis without any particular reference to the position of the head. Finally, some of the German accoucheurs recommend the blades to be placed on the sides of the pelvis in all cases, without regard to the position of the head. This precept is followed as a matter of necessity when the head is high up. But when engaged in the excavation, it will be found better in the majority of cases to follow the rule which we have given.

7. *The second blade is always introduced above and in front of the first;* so that, in some instances, the male branch is found over the female one, as in Fig. 136; *i.e.* between it and the symphysis pubis. It will then be necessary, in locking the blades, to cross the handles, by making the female one pass above the male. Attempts have been made of latter time to avoid this crossing, and a particular kind of forceps has been devised by Tureaux, Tarsitani, and some others for the purpose, which can be made to lock whatever may be the relative position of the handles. This is doubtless an advantage, but its importance has certainly been exaggerated.

Fig. 136.



Introduction of the second branch.

8. *No force should ever be used in pushing the blades up.*—The obstacles met with during their introduction are nearly always created by folds of the scalp or vagina, in which the point of the blade becomes entangled; or else the difficulty is owing to

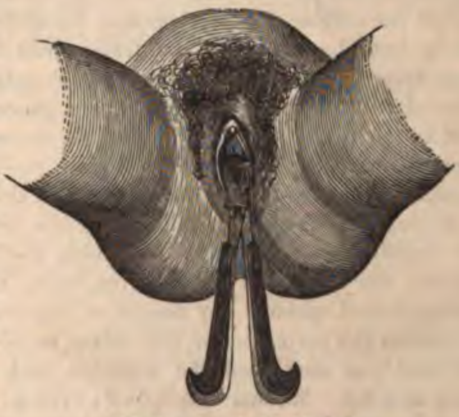
the circumstance that the blade, being improperly directed, is not pushed up in the line of the pelvic axis, and consequently strikes against the vaginal walls. These are easily obviated by varying the direction of the instrument a little, or by carrying its handle towards one or the other thigh, and by depressing or elevating it in a slight degree. Force is always useless and may be injurious. Thus, if the point of the male blade was arrested by a fold of the scalp, the instrument should be partially withdrawn, and its handle be carried toward the right thigh, whereby the extremity of the blade would be somewhat removed from the head, and could thus pass beyond the obstacle; but if, on the contrary, it were arrested by one of the transverse folds of the vagina, the handle should be carried toward the left thigh, so as to make the point rest against and slip over the head.

The introduction of the second branch is generally the most difficult, and the difficulty is generally greatest when it is necessary to introduce it the first. When attempts, prudently made, prove fruitless, there should be no hesitation in withdrawing both branches, and beginning again with the one which before was introduced last. It were much better to renew the operation two or three times, than to strive pertinaciously against difficulties which could never be surmounted without endangering to a greater or less extent the life of the fœtus, or the integrity of the maternal organs.

In withdrawing the branches, they should be made to describe a curve the opposite of that which they followed during their introduction; the handle of the male branch, for example, should be gradually raised above the pubis, and reclined obliquely upon the left groin.

9. *Mode of locking.*—In general, the locking is easily effected by bringing the two branches together after their introduction and adjusting the pivot in the mortise (Fig. 137), when an assistant turns the former; but this part of the operation demands a perfect parallelism between the two portions of the forceps which, unfortunately, does not always occur. For it frequently happens that the pivot does not fit into the mortise exactly, either because one or both blades are turned outwards, or because one has penetrated deeper than the other. In the former case, we should endeavor to correct the deviation gently, by grasping the handles with the whole hand, and in the latter by withdrawing or pushing up one of them. But in none of these attempts should much force ever be used; for when considerable difficulty is met with, it is probably owing to an improper adjustment of the instrument, and it is far better to extract one or even both blades than to force their locking.

Fig. 137.



The forceps applied and locked.

10. *We must be satisfied that the head is properly secured, and that it alone is included in the clams of the instrument.*—To be convinced that no part of the mother's organs is pinched between the head and the forceps, it is only requisite to make a moderate pressure on the handles, after the locking, when, if the patient does not complain of pain, the operation may be continued without danger; if the contrary is the case, the forceps ought to be unfastened, and the included part be removed by the finger. A few gentle tractions made by the forceps, without compressing the head too much, will serve to show whether the latter is properly secured, and that the instrument does not slip.

11. *The tractions ought to be made in the direction of the pelvic axis.*—If the head is at the superior strait, we must first draw downwards and backwards as much as possible; then, as it descends into the excavation, the handles are gradually elevated, so that, by the time it reaches the inferior strait, they are found directed forwards and somewhat downwards; and the tractions will then be made in this latter direction. But whilst the head is undergoing its movement of extension, the instrument must be carried up in front of the symphysis pubis, and afterwards of the abdomen, so that, after the complete delivery of the head, the forceps shall be lying almost horizontally over the woman's belly.

In performing the tractions, the right hand is placed near the clams and above the instrument, the left hand in front of the articulation and beneath. But as soon as the disengagement is to be effected by raising the instrument above the pubis, the position of the hands must be changed, and the left one always be placed in front of the pivot, but above, and the right one below the extremity of the branches.

The tractions are to be made during a pain whenever possible, and the patient should be encouraged to bring the abdominal muscles into play, in aid of the uterine contractions and the efforts of the accoucheur. As soon as the head has cleared the inferior strait, and when it only has the resistance from the soft parts to overcome, the vulva being at the same time freely dilated, all tractive force should, as a general rule, be abandoned, and the rest be left to the powers of nature; for the mere presence of the head at the external parts, by the tenesmus it gives rise to, will most certainly bring on a sufficient degree of contraction to effect the delivery.

Be satisfied, then, with facilitating the process of extension, by carrying the handles up in front of the pubis during the mother's bearing-down efforts; the dilatation of the vulva, being thus slow and gradual, will be accomplished without any danger of rupture, especially if you are careful to sustain the perineum, or, still better, to have it supported by an assistant; for, had you continued the tractions, such a rupture could scarcely have been avoided. Madame Lachapelle even advises the instrument to be withdrawn altogether; but I think it is better to leave it *in situ*, for the double interest of the patient and the accoucheur: of the patient, because, in some cases, a few tractions may yet be necessary; and of the physician, because, if he remove the forceps from prudential motives, and with a view of saving the parts, before the final delivery of the head, he might be regarded by the woman and her attendants as a bungler, who had failed in his operation.

He should, therefore, leave it applied, and allow the patient to expel it and the head together.

In cases attended with difficulty, we might doubtless draw on the handles with a certain amount of force; but the example of some practitioners who, taking a point of support by placing a foot against some solid body, hang, as it were, on the handles of the forceps, and then pull away with all their strength, should never be followed. It is only necessary to use the arms, and the operator should take such a position that his body would always arrest any sudden slipping of the blades. In fact, it is this precaution which sometimes renders an application of the forceps so excessively fatiguing to him.

12. *In the oblique or transverse positions, such a movement of rotation is to be imparted to the head as shall bring the concave margin of the blades directly in front.*—This rotation ought to be performed during the tractions, just as the head is approaching or clearing the inferior strait. But there is no occasion for any violent exertions, for most generally the head turns in its descent, carrying the instrument along with it in the rotation. Sometimes, also, an application of one or both blades is all that is necessary to effect this change.

ARTICLE III.

SPECIAL RULES.

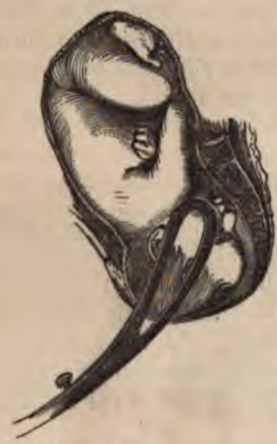
We have already stated that the forceps may be applied in the vertex and face presentations, and on the head when left behind after the delivery of the trunk. Its application is, therefore, to be studied in these three varieties; and as the greater or less elevation of the head greatly influences both the course to be pursued and the degree of facility with which the operation is accomplished, we shall examine those cases successively in which it has reached the inferior strait, in which it is still engaged at the superior strait, and in which it is entirely above the latter.

§ 1. Application of the Forceps in Vertex Positions, when the Head has reached the Inferior Strait.

The vertex, having descended to the inferior strait, may be found in correspondence with the various points of its circumference; and, therefore, to meet every possible case, we shall have to admit eight principal positions of it: thus, the occiput may be in relation with both extremities of the coccy-pubal diameter (the occipito-anterior and the occipito-posterior positions); with both extremities of each oblique diameter (the left anterior and the right posterior occipito-iliac, and the right anterior and the left posterior occipito-iliac positions); and with both extremities of the transverse diameter (the left and right transverse occipito-iliac positions).

A. *Occipito-anterior Position.*—In this position, the occiput is placed behind or under the lower part of the symphysis pubis; the sides of the head corresponding to those of the pelvis. The male blade will here be introduced first, because it will be found underneath in the locking. Two or three fingers of the right hand having been passed into the vagina, this branch is seized by the left hand, either with the fingers, like a writing-pen, or, still better, with the whole hand (though in both cases close to the pivot), and it is held inclined obliquely over the right groin; the point of the blade is then entered at the vulva in the direction of its axis, and is slipped up along the palmar surface of the fingers; as the blade is passed into the vagina, the handle is gradually depressed between the woman's thighs (of course, always approaching towards the median line) in such a way as to direct the point of the blade in the direction of the axis of the excavation. The blade is thus directed at once upon the side of the head, and along that of the pelvis, where it is ultimately to be placed. While this manœuvre is being effected, the convex border of the blade ought to rest upon and glide along the ring-finger of the right hand, which is in the vagina, whilst at the same time its concave surface should bear exactly on the convexity of the head, and follow its outline. The female blade is then introduced in the same manner precisely. Two or three fingers of the left hand are first passed in on the right side of the pelvis; the branch being held obliquely by the right hand in front of the left groin, with its point resting on the palmar surface of the left hand, is presented at the vulvar orifice; and as its extremity is made to enter, the handle is depressed, and brought towards the median line by degrees, the blade being thus passed up on the right side of the pelvis, with the same precautions as in the former case.

FIG. 138.



The forceps applied on the child's head in the occipito-anterior position, at the inferior strait.

When both blades have penetrated to the same depth, they ought to be parallel with each other, the pivot corresponding to the mortise exactly; and the locking is then completed without difficulty.

As the head is at the inferior strait, the first tractions will have to be made in the direction of the axis of this strait, that is to say, a little downwards and forwards; then, as soon as the occiput has passed under the sub-pubic ligament, and the head has commenced its movement of extension, the instrument is to be gradually carried upwards in front of the symphysis and abdomen.

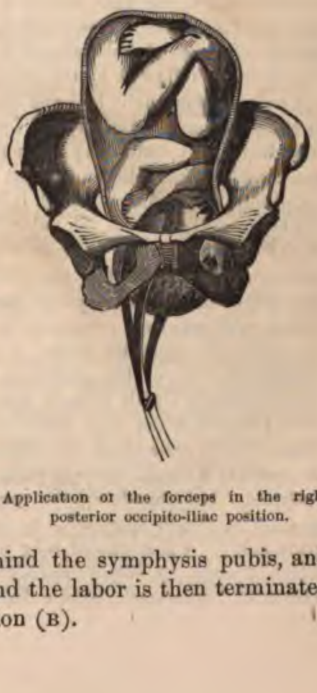
B. *Occipito-posterior Position.*—The blades are applied and locked as in the preceding case. But here, notwithstanding the head is at the inferior strait, we are not to draw in the line of axis of this strait; because, in these occipito-posterior positions, the occiput has to be delivered first at the anterior perineal commissure. (See *Natural Labor.*) To effect this object, it is necessary to carry the handles a little upwards at the very outset of the tractions, so as to flex the head on the chest more completely; being careful to operate in such a way that the artificial aid may bear particularly on the larger extremity of the head. When the occiput has gained the perineal commissure, the traction is discontinued, or rather, if there is any further occasion for it, we may draw moderately, at the same time depressing the handles of the instrument towards the anus.

[The head should be extracted very slowly, because the highly distended perineum, which bulges greatly before the occiput, would inevitably give way under an attempt at too rapid delivery. The operation is far more troublesome than in a case of occipito-anterior position, and as it requires the use of greater force, demands also the exercise of great care and prudence to avoid a laceration.]

C. *Left Anterior Occipito-Iliac Position.*—In this position, one side of the head looks forward and to the right, the other backward and to the left; and the blades are to be applied in a corresponding manner on the sides of the head. The posterior blade, which should be entered first, will at the same time be on the left, and, therefore, the one that is always passed on the left side of the pelvis, that is to say, the male blade, will be introduced first. This is held in the left hand just in front of the right groin; and its point, placed in front of the left sacro-sciatic ligament, is to be pushed directly backwards as far as the sacro-iliac articulation, whilst the operator depresses the handle and draws it towards the median line. In carrying the handles down between the mother's thighs, it is highly important to keep the blade slightly everted. Being once introduced, the handle is given to an assistant, who holds it near the internal surface of the left thigh.

The female blade is to be placed behind the right cotyloid cavity, where the side of the head is found, by making it describe the spiral movement alluded to when speaking of the general rules of the operation. The operator accomplishes this by taking it in the right hand, in the usual way, and entering the point of the blade just in advance of the right sacro-sciatic ligament; then, pushing it in this direction for about an inch, he suddenly changes the position of his hand so as to get hold of the instrument from above, when, by strongly depressing its handle along the internal surface of the left thigh, he makes the blade execute a see-saw movement, by which it is at once carried from the right sacro-sciatic ligament up opposite to the cotyloid cavity of the same side; and then the locking is effected. (Fig. 139.) During the early tractions he should endeavor to rotate the head so as to bring the occiput behind, and then under the symphysis pubis. The rest of the operation is completed as in the first variety (A).

FIG. 139.



Application of the forceps in the right posterior occipito-iliac position.

D. *Right Posterior Occipito-Iliac Position.* The forceps are applied here exactly in the same way as they were in the preceding case; the blades being entered, the one behind and to the left, the other in front and to the right (see Fig. 139); their concave margins looking towards the forehead. As this latter part must be brought in front, the object of the rotation will be to get it behind the symphysis pubis, and the occiput into the hollow of the sacrum; and the labor is then terminated just as in an original occipito-posterior position (B).

[The effort required is sometimes so great, that some operators have thought it would be better in very difficult cases, to rotate the forceps upon its axis, in order to turn the head in the cavity of the pelvis, as it sometimes turns spontaneously, rolling the occiput, in fact, from behind forward, bringing it first to the side of the pelvis and finally behind the pubis. The plan has numerous opponents, who say that it turns the head through more than a quarter of a circle, whilst the body is held fast by the contracted uterus and thus exposes to the occurrence of fatal lesions in the cervical region of the spinal column.

These objections are more theoretical than real, and we have endeavored to refute them in another work (*Accouchements*, par Lenoir, Sée, et Tarnier). At any rate, clinical facts have proved that the occiput may be brought to the front and a living child born in an occipito-posterior position.[1]

---

[1] A young woman, pregnant with her first child, having reached her full term without accident, was taken with her first pain on the 29th of October, at nine P. M. The pains, though feeble, were yet so frequent as to prevent her sleeping. At six o'clock on the morning of the 30th, I found the neck completely effaced, and the thinned edges circumscribing an orifice of about the size of a dime. The pains occurred every ten minutes. I found the vertex presenting, but could not make out the position. The pains continued all day, the 30th, but quite as feeble and distant. At four o'clock in the evening they became stronger and more frequent, and at eight o'clock the diameter of the orifice was rather less than that of half a dollar. The membranes being flattened and applied closely to the head, enabled me to discover the biparietal (*coronal*) suture running directly from before backwards, and *on several different occasions* I distinctly felt the anterior fontanelle presenting directly forward and corresponding nearly with the upper third of the posterior surface of the pubis. I had to deal with what had never before occurred to me, a *direct occipito-sacral* position, engaged in the upper third of the excavation. I hoped in vain for its spontaneous conversion into a posterior diagonal position, for, notwithstanding very frequent and powerful contractions, things were still in *statu quo* the next day, the 31st, at six o'clock. The orifice was at this time dilated to the size of a dollar. At noon, the dilatation was almost complete, and finally, at two o'clock, the head assumed a diagonal position. I detected very positively the anterior fontanelle in front and to the left, and hoped that the movement of rotation would continue. I was doomed to be disappointed. I then ruptured the membranes, but this was followed by the escape of but a few spoonfuls of fluid. At four o'clock, the anterior fontanelle had approached, I thought, somewhat nearer the left extremity of the transverse diameter, and I encouraged the poor patient to believe that her labor would soon be terminated; but, unfortunately, instead of continuing to pass backward, the anterior fontanelle underwent a movement in the opposite direction, and, notwithstanding all my efforts to push it back, it again came forward, and fixed itself opposite the horizontal ramus of the pubis, from which it did not stir afterward. At ten o'clock in the evening, things being in the same condition, I determined to apply the forceps, as much in the interest of the mother whose strength was exhausted, and who begged me to deliver her, as in that of the child.

The head was then very near the inferior strait, and the forceps were applied without difficulty upon its sides. I made traction, with the object of disengaging the occiput in front of the perineum, but the contractions were feeble, and the woman being exhausted with fatigue, was unable to assist the efforts of the uterus, and being thus reduced to the mere tractions with the instrument, I could not make the head advance. In spite of all my efforts, I was unable to overcome the great resistance of the perineum which was very thick and unyielding, so that my attempts were altogether fruitless. If I abandoned the operation, I had nothing to rely upon but the resources of nature, which here were unfortunately, powerless, or else the performance of craniotomy. I had waited long enough to test the powers of the organism, besides which, a more prolonged expectation would not be devoid of danger to both the mother and child. Therefore, before deciding on craniotomy, I determined to try whether it

When, in a posterior occipito-iliac position, it is found very difficult to depress the occiput, it is allowable to bring it to the front. To effect it, the forceps are to be rotated so as to bring the occiput first to the side of the pelvis in a transverse occipito-iliac position. When this happens, one of the blades is directly in front and the other directly behind, provided, the head was seized from one ear to the other. The instrument is then to be disarticulated, in order to reapply it as in a primitive transverse occipito-iliac position. In a future paragraph it will be told how to proceed to this application. (See *Application of the Forceps in Transverse Positions.*) Some operators, however, do not fear to complete the rotation without unlocking the instrument, which has then an abnormal direction, the smaller curvature being behind and the large convex one in front, the male branch to the right and the female to the left, and all without any great inconvenience, provided the operator be adroit. Nevertheless, the direction described is one to which Levret's forceps is not adapted.]

E. *Right Anterior Occipito-Iliac Position.*—In this case, the female blade is entered just in advance of the right sacro-iliac articulation. Then the male blade is introduced in front of the left sacro-sciatic ligament, and is made to describe the spiral movement before indicated, by which it becomes placed opposite to the left cotyloid cavity. The movement of rotation will be effected from right to left, and the occiput be brought under the pubic arch.

F. *Left Posterior Occipito-Iliac Position.*—The blades are introduced in a similar order, and in the same way, as in the preceding case. The movement of rotation is also effected in the same direction, but here it will bring the forehead instead of the occiput behind the symphysis. The handles of the instrument are next carried up a little in front of the pubis, with a view of freeing the occiput first at the anterior perineal commissure. After this is accomplished, the handle is to be depressed towards the anus, so as to assist the head in its movement of extension.

[In case it should be found difficult to disengage the occiput posteriorly, the head may be turned so as to bring the occiput behind the pubis; in short, to follow the same course as indicated for the right posterior occipito-iliac position (D). It will be understood that in this case, the head is to be turned from behind forward, and from left to right, in accordance with the same route which it usually follows in natural delivery.]

G. *Left Transverse Occipito-Iliac Position.*—In this variety, the occiput corresponds to the left extremity of the transverse diameter of the pelvis;

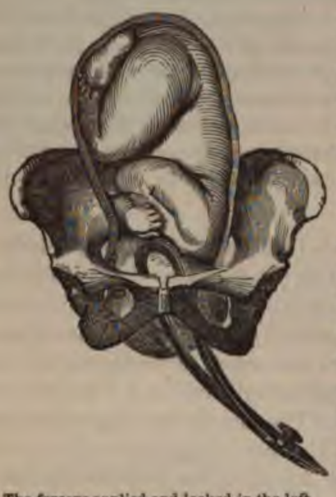
---

would not be possible to bring the occiput in front. I left off the tractions, and rotated the forceps on its axis, and carrying the head along in this movement, I had soon directed the concavity of the edges of the instrument toward the internal surface of the left thigh. I then withdrew the instrument and found that the longitudinal suture was directly transverse. Introducing the female branch behind and to the left side, I used it as a lever, and succeeded with it in bringing the occiput almost directly behind the right acetabulum. The male branch was then placed behind the left acetabulum, and the forceps being locked after uncrossing the branches, I brought the occiput first behind, then beneath the symphysis pubis, and finished the extraction of the head by the usual movement of extension.

The child was born in an evident state of congestion. I allowed the cord to bleed before tying it, and it was soon restored. Two weeks afterward it was strong and well. The lying-in was unattended with accidents and the mother recovered quickly. The whole duration of the labor was fifty hours.

one side of the head looks directly forward, and the other backward. Here also the posterior blade is to be introduced first: now to distinguish which will be the posterior one under such circumstances, we must ascertain to what part of the pelvis the present posterior side of the head will correspond after the rotation shall have been completed. As this process of rotation, in the transverse positions, must always bring the occiput in front, the left, or posterior side of the head, will then look towards the mother's left ilium, and consequently the left or *male* blade is entered first. This blade is, therefore, pushed towards the left sacro-iliac articulation, and when it has penetrated to the proper depth, it is pressed into the hollow of the sacrum by bearing on its concave margin with the fingers already in the vagina. The female blade is next to be passed up by means of a spiral movement, behind the right acetabulum; and then the hand in the parts must endeavor to work it towards the median line, by pressing on its convex margin, so as to get it just behind the symphysis pubis. From the extent of the rotation to be effected, of course the accoucheur must be very careful to operate slowly and gently.

FIG. 140.



The forceps applied and locked in the left transverse occipito-iliac position.

When the head is in a transverse position, it is occasionally still high up in the excavation, even though it has, in a great measure, cleared the superior strait; and when this occurs, it is often exceedingly difficult to apply one of the blades in front and the other behind; in some cases even we are obliged to enter them on the sides of the pelvis, that is, to seize the head by the forehead and occiput. This is always an unfavorable circumstance; although it may possibly happen that the mere application of the instrument will be sufficient to give the head an oblique or even a direct antero-posterior direction; and when this movement does not take place at the time the blades are entered, it is often effected afterwards by their locking, or during the first tractions. Again, when the forceps is thus applied, the head may occasionally clear the inferior strait in a transverse position; but, having reached the vulvar orifice, it then turns between the blades, or, as I have several times observed, carries the instrument along with it in the movement of rotation, in such a way that, when the occiput is turned forwards, the concave border of the blades looks towards one side. In this latter case, some practitioners recommend the instrument to be withdrawn as soon as the head has nothing but the resistance of the soft parts to overcome, and, if necessary, to reapply them to the sides of the head. I think it would be better to remove the forward or sub-pubic blade only, for its presence might retard the process of extension, but to leave the perineal one applied, because, in case of necessity, it may act as a lever in facilitating the extension.

The difficulty experienced in applying the forceps on the parietal protuberances in the transverse positions engaged in the excavation, often becomes (see hereafter) an impossibility, when the head is arrested at the superior strait or above it. To render the biparietal application possible, M. Baumers, of Lyons, has constructed a new forceps, which I have had occasion to try, and which appears to me to overcome the difficulty mentioned. I am convinced that the biparietal application of the blades, which is impossible with the ordinary forceps, is sometimes easy with that of M. Baumers, and I think it right to recommend their application in the transverse positions. They differ from Levret's forceps in being curved on the side instead of the edge, so that the general curvature of one of the branches is concave, and that of the other convex. For further details respecting this instrument and the mode of applying it, see the *Gazette Médicale des* 14 *et* 21 *juillet*, 1849.)

This modification of M. Baumers is altogether similar to that suggested by Uytterhoeven. This Belgian surgeon, it is stated by M. Van Huevel, constructed, forty years ago, a forceps with the blades curved forwards on their sides, as the others are on the edges. (See the Atlas accompanying the Belgian edition of this work, Fig. 194.)

H. *Right Transverse Occipito-Iliac Position.*—In this position, the application of the forceps scarcely differs from the one just described, excepting that the female branch is introduced first, and the movement of rotation is to be made from right to left, and from behind forwards. When the occiput gets behind the symphysis pubis, the labor is to be terminated as in the preceding case.

§ 2. APPLICATION OF THE FORCEPS IN THE VERTEX POSITIONS, WHERE THE HEAD IS MERELY ENGAGED AT THE SUPERIOR STRAIT.

Whenever the head is engaged or locked in the superior strait, and the vertex occupies the whole upper part of the excavation, the rules for guiding us in the application of the forceps are the same as those already laid down for its use at the inferior strait. We must remark, however, that its elevated position renders an introduction of the whole hand into the vagina more necessary than ever; that the points of the fingers ought to be carefully placed between the head and the cervix uteri, so as to direct the blade, which is slipped along the palmar surface of the hand, directly into the uterine cavity; that, as it is higher up than usual, the blades are to be pushed further in, in order to grasp it freely; and lastly, that, as the head is not yet clear of the superior strait, the first tractions must be made in the direction of the axis of that strait, or in other words, as far backwards and downwards as possible.

But, although the theoretical precepts remain unchanged, it must not be supposed that the difficulties are no greater here than in the former case; for the elevation of the part renders the application of the forceps more difficult and less certain, as it is not an easy matter to apply the blades on the sides of the head, in the oblique and more especially in the transverse positions. In a word, the higher up it is, the more likely are we to encounter those difficulties and dangers about to be described in applying the instrument on a movable head above the brim of the pelvis.

§ 3. APPLICATION OF THE FORCEPS IN THE VERTEX POSITIONS, WHEN THE HEAD IS MOVABLE ABOVE THE SUPERIOR STRAIT.

There are many circumstances that may require the intervention of art, even while the head is still above the superior strait; and as the nature of these causes of dystocia may have a bearing on the operative procedure for terminating the labor, we must here take them into consideration.

The intervention of our art may be rendered necessary by an accident that endangers the life of the mother or child, such as hemorrhage, convulsions, or a descent of the cord, &c., as also by a contracted pelvis or an excessive volume of the head. In the latter case, a resort to the forceps is proper, provided the disproportion between the pelvic dimensions and the size of the head be not very great; since it has elsewhere been shown (see *Deformities of the Pelvis*) that, whenever the smallest diameter of the pelvis amounts to three inches, there is reason to expect that delivery can be effected by means of the forceps.

The question arises, whether version or an application of the forceps is to be resorted to in those cases in which the pelvis is properly formed, but some accident has taken place that requires a speedy termination of the labor? Under such circumstances, we do not hesitate to recommend pelvic version; but as this is not the universally received opinion, we extract from Madame Lachapelle the following reasons on which we ground our preference:

"An application of the instrument upon a head which is still above the superior strait is both a difficult and a dangerous operation. Difficult, 1st, because its elevation renders the diagnosis of the position obscure, and often leaves us operating in the dark; 2d, from its mobility it escapes from the forceps, and not unfrequently it is merely held by the points or margin of the blades; so that, as soon as any resistance is met with from the first tractive efforts, it slips out just like a cherry-stone when squeezed between the fingers; and, 3d, because at this height it is impossible to apply the blades on the sides of the head, since the latter is usually found either in an oblique or in a transverse position. Now, to conform to the rule generally laid down, we should apply one blade in front and the other behind, but this is obviously impracticable, for the curvature of the pelvic axis prevents the forceps from passing far enough in, unless the blades are introduced along the sides of the pelvis.[1] Dangerous, because the hold on the head, being very imperfect, in consequence of the difficulties just enumerated, the instrument may slip; and, should such slipping take place while we are making strong tractions on the handles, the edges of the forceps, acting like a cutting instrument, might seriously wound the cervix."

---

[1] When an attempt is made to apply them over the parietal regions, the perineum presses the instrument forward, and gives it such a degree of obliquity with regard to the superior strait, that there is not room enough between the fenestræ for the reception of the smallest-sized head. The latter, being placed above the abdominal strait, has its long diameter situated very nearly in the line of the axis of that strait; but as the long axis of the head ought to correspond with that of the blades, it therefore follows that the forceps must be introduced in the direction of the axis of the upper strait; and, consequently, that the articular part of the instrument is to be depressed beyond the point of the coccyx. But the perineal resistance will evidently prevent

We, therefore, prefer version in the case under consideration. However, there is one instance which might demand the use of the forceps; that is, where the uterus is so contracted on the child's body after the discharge of the waters, as to render an introduction of the hand or an evolution of the fœtus absolutely impossible; but fortunately, in such a case, the head would be so firmly held at the strait, during the strong contractions of the organ, as to be nearly immovable.

On the whole, then, the application of the forceps above the superior strait should be limited to those cases of pelvic deformity in which the shortest diameter of the pelvis does not exceed three to three and a quarter inches, and to those in which the uterus is firmly contracted.

Mode of Application.—Unless the position is directly antero-posterior, which is extremely rare, no attempt should be made to apply the blades upon the parietal protuberances, but they should be passed along the sides of the pelvis. It is, however, very unusual for this precept to be followed in practice, and for the blades to be really placed upon the two extremities of the transverse diameter; when the head is diagonal, the blades are naturally directed toward the two extremities of one of the oblique diameters. Now in the directly transverse positions, this is what generally happens, even when the surgeon wishes to place them at the sides of the pelvis; for at this elevation, and especially in the sacro-pubic contractions, which are the most common, the head is almost always in a transverse position; now, according to the remark of Ramsbotham and of Simpson, and notwithstanding the formal precept always to apply the blades to the sides of the pelvis, it is found after delivery that the head has not been seized from the forehead to the occiput. The marks of the blades are almost always to be discovered upon one of the occipital protuberances and the parietal projection opposite. It is natural, in fact, if the head is transverse, for its long diameter to correspond with the transverse diameter of the pelvis. Now, as the latter is narrowed from before backward, the blades can be applied readily, only by directing one of them behind the acetabulum, and the other in front of the sacro-iliac symphysis, which are the only points not occupied by the head. This, therefore, is the direction which should be given them in all cases.

As soon as the forceps are applied, it would in most cases be advisable to tie the handles together before drawing upon them. At first, the tractions should be made as far back as possible, and the instrument ought to be gradually brought forward as the head descends into the excavation. The head, seized by one coronal boss and the opposite occipital protuberance,

---

this, where one blade is entered behind the pubis and the other in front of the sacrum. Therefore, we are obliged to introduce the blades along the sides of the pelvis; that is, to seize the head by the forehead and occiput in the transverse positions, and by the coronal and occipital protuberances in the oblique positions. M. Baumers' instrument might in some cases overcome these difficulties.

positions. In a word, the higher up it is, the more likely are we to encounter those difficulties and dangers about to be described in applying the instrument on a movable head above the brim of the pelvis.

§ 3. Application of the Forceps in the Vertex Positions, when the Head is movable above the Superior Strait.

There are many circumstances that may require the intervention of art, even while the head is still above the superior strait; and as the nature of these causes of dystocia may have a bearing on the operative procedure for terminating the labor, we must here take them into consideration.

The intervention of our art may be rendered necessary by an accident that endangers the life of the mother or child, such as hemorrhage, convulsions, or a descent of the cord, &c., as also by a contracted pelvis or an excessive volume of the head. In the latter case, a resort to the forceps is proper, provided the disproportion between the pelvic dimensions and the size of the head be not very great; since it has elsewhere been shown (see *Deformities of the Pelvis*) that, whenever the smallest diameter of the pelvis amounts to three inches, there is reason to expect that delivery can be effected by means of the forceps.

The question arises, whether version or an application of the forceps is to be resorted to in those cases in which the pelvis is properly formed, but some accident has taken place that requires a speedy termination of the labor? Under such circumstances, we do not hesitate to recommend pelvic version; but as this is not the universally received opinion, we extract from Madame Lachapelle the following reasons on which we ground our preference:

"An application of the instrument upon a head which is still above the superior strait is both a difficult and a dangerous operation. Difficult, 1st, because its elevation renders the diagnosis of the position obscure, and often leaves us operating in the dark; 2d, from its mobility it escapes from the forceps, and not unfrequently it is merely held by the points or margin of the blades; so that, as soon as any resistance is met with from the first tractive efforts, it slips out just like a cherry-stone when squeezed between the fingers; and, 3d, because at this height it is impossible to apply the blades on the sides of the head, since the latter is usually found either in an oblique or in a transverse position. Now, to conform to the rule generally laid down, we should apply one blade in front and the other behind, but this is obviously impracticable, for the curvature of the pelvic axis prevents the forceps from passing far enough in, unless the blades are introduced along the sides of the pelvis.[1] Dangerous, because the hold on the head, being very imperfect, in consequence of the difficulties just enumerated, the instrument may slip; and, should such slipping take place while we are making strong tractions on the handles, the edges of the forceps, acting like a cutting instrument, might seriously wound the cervix."

---

[1] When an attempt is made to apply them over the parietal regions, the perineum presses the instrument forward, and gives it such a degree of obliquity with regard to the superior strait, that there is not room enough between the fenestræ for the reception of the smallest-sized head. The latter, being placed above the abdominal strait, has its long diameter situated very nearly in the line of the axis of that strait; but as the long axis of the head ought to correspond with that of the blades, it therefore follows that the forceps must be introduced in the direction of the axis of the upper strait; and, consequently, that the articular part of the instrument is to be depressed beyond the point of the coccyx. But the perineal resistance will evidently prevent

We, therefore, prefer version in the case under consideration. However, there is one instance which might demand the use of the forceps; that is, where the uterus is so contracted on the child's body after the discharge of the waters, as to render an introduction of the hand or an evolution of the fœtus absolutely impossible; but fortunately, in such a case, the head would be so firmly held at the strait, during the strong contractions of the organ, as to be nearly immovable.

On the whole, then, the application of the forceps above the superior strait should be limited to those cases of pelvic deformity in which the shortest diameter of the pelvis does not exceed three to three and a quarter inches, and to those in which the uterus is firmly contracted.

Mode of Application.—Unless the position is directly antero-posterior, which is extremely rare, no attempt should be made to apply the blades upon the parietal protuberances, but they should be passed along the sides of the pelvis. It is, however, very unusual for this precept to be followed in practice, and for the blades to be really placed upon the two extremities of the transverse diameter; when the head is diagonal, the blades are naturally directed toward the two extremities of one of the oblique diameters. Now in the directly transverse positions, this is what generally happens, even when the surgeon wishes to place them at the sides of the pelvis; for at this elevation, and especially in the sacro-pubic contractions, which are the most common, the head is almost always in a transverse position; now, according to the remark of Ramsbotham and of Simpson, and notwithstanding the formal precept always to apply the blades to the sides of the pelvis, it is found after delivery that the head has not been seized from the forehead to the occiput. The marks of the blades are almost always to be discovered upon one of the occipital protuberances and the parietal projection opposite. It is natural, in fact, if the head is transverse, for its long diameter to correspond with the transverse diameter of the pelvis. Now, as the latter is narrowed from before backward, the blades can be applied readily, only by directing one of them behind the acetabulum, and the other in front of the sacro-iliac symphysis, which are the only points not occupied by the head. This, therefore, is the direction which should be given them in all cases.

As soon as the forceps are applied, it would in most cases be advisable to tie the handles together before drawing upon them. At first, the tractions should be made as far back as possible, and the instrument ought to be gradually brought forward as the head descends into the excavation. The head, seized by one coronal boss and the opposite occipital protuberance,

this, where one blade is entered behind the pubis and the other in front of the sacrum. Therefore, we are obliged to introduce the blades along the sides of the pelvis; that is, to seize the head by the forehead and occiput in the transverse positions, and by the coronal and occipital protuberances in the oblique positions. M. Baumers' instrument might in some cases overcome these difficulties.

will soon reach the inferior strait. In thus traversing the whole excavation, the head may possibly turn within the blades and become converted into an antero-posterior position; but it may also happen that this spontaneous version does not take place at all. If, therefore, the obstacle exists at the superior strait alone, and the uterine forces appear adequate to the prompt termination of the labor, we may withdraw the instrument and trust the rest to nature. But in other cases I think it would be proper to endeavor to transfer the blades to the sides of the head, or even to reapply them in accordance with the precepts before given for their application at the inferior strait. It is evident that, with the assistance of Baumers' forceps, the latter inconvenience would be avoided.

§ 4. Application of the Forceps in the Face Positions.

When the face presents, an application of the forceps may become necessary, either when the head has descended to the inferior strait, when it is engaged at the superior one, or when it is still movable above the brim of the pelvis.

1. *When the Head is at the Inferior Strait.*—If both the head and the pelvis retain their usual size, the face can only reach the perineal floor by descending with the chin directly forwards, or nearly so. (See *Mechanism of Face Positions.*) As the application of the forceps in these three different cases does not differ in the least from that described in the corresponding vertex positions, we deem it useless to pass over the same ground.

But the face, without having reached the perineal strait, may, nevertheless, be low down in the excavation; and the process of rotation, whereby the chin should be brought under the pubic arch in all cases, may not have commenced at all, or it may either be partially accomplished or fully completed. We might, therefore, have to apply the forceps in a mento-anterior or pubic, in a left or a right anterior mento-iliac, or in a left or a right transverse mento-iliac position.

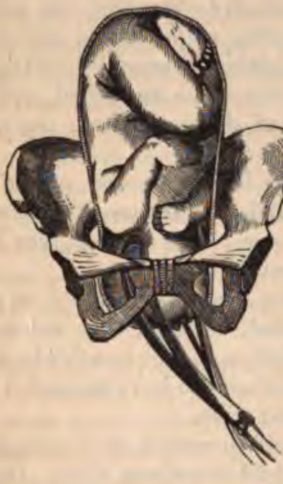
Since it is absolutely necessary, in the face positions, for the chin to come under the pubic arch, the instrument is always to be applied with its concave edges looking towards the chin, taking care to introduce the posterior blade first.

By way of example, let us suppose that the face is situated in a left anterior mento-iliac position, and is low down in the excavation. Here, in conformity with the directions before given, the male blade will be placed posteriorly and to the left, near the left sacro-iliac articulation, and the female blade just behind the right anterior arch of the pelvis; when locked, the concave edges of the blades will look forwards and to the left. The rotation is then effected from behind forwards, and from left to right, so as to bring the chin behind the symphysis; and when this is accomplished, we draw directly forwards, and a little downwards, in order to free this part from the pubic arch; and then, after having secured its delivery, the handles are gradually carried up, at the same time drawing moderately, with a view of promoting the flexion and disengagement of the head.

2. *When the Head is at the Superior Strait.*—The face may be found in every possible relation with the different parts of this strait. Should the

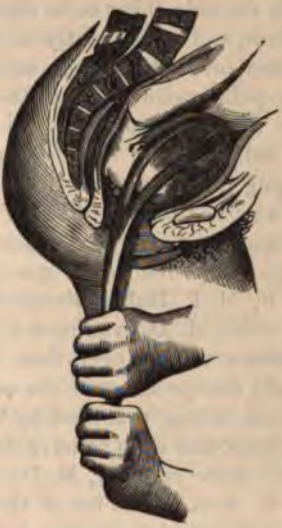
chin correspond to any portion of its anterior half, the forceps may be applied without any particular difficulty; but if the face is in a mento-posterior position, the pelvic or cephalic version, whenever possible, ought to be chosen in preference. For when the forceps is once applied, the object would evidently be to bring the chin behind the symphysis pubis; but as the body is probably held motionless by the contraction of the womb, it will not participate in the rotation of the head produced by the instrument, and hence luxation would occur at the joint between the first and second cervical vertebræ, which does not admit of movement beyond a quarter of a circle.

FIG. 141.



Application of the forceps in the left anterior mento-iliac position.

FIG. 142.



Application of the forceps in the mento-posterior position.

When the face is situated in a mento-posterior position, and has descended so far into the excavation that it is altogether impossible to return it above the superior strait with a view of performing the cephalic or the pelvic version, the use of the forceps becomes a matter of necessity. Under such circumstances, we should therefore apply them for the purpose of relieving the mother from her threatened danger; not, as we observed in the preceding editions, to bring the chin in front, but merely with the intention of flexing the head, and converting the face position into one of the vertex. To accomplish this, the blades are to be placed on the sides of the head, and in operating, the handles should be depressed as far backwards as possible, so as to act chiefly on the vertex, until the occiput is brought down under the pubic arch; if the chin were directly posterior, such a movement of rotation might be given to the head, prior to any tractive effort, as would carry the former into the great sciatic notch on one side or the other. This appeared to me the most feasible operation some years ago. I observed, however, that, according to M. Mascarel, (*Thesis*, page 84,) M. P. Dubois has proposed another; or rather he inquires whether it would not be possible to convert a mento-posterior into a mento-anterior position. It may be objected, he continues, that, if the head is forced to undergo too great a rotation, and the body does not turn simultaneously, the child's neck would be twisted; but as the only thing to be done, if this will not answer, is to perforate the cranium, and consequently to sacrifice the infant, he considers the former measure preferable; more especially as the chin might escape under the ischio-pubic ramus, without the necessity of getting it exactly beneath the pubic arch. I know that this method has sometimes succeeded, and M. Blot informed me quite recently, that he had delivered three times, by bringing the chin in front.

It may be that the shape of the instrument is, in this case, one of the principal causes of the difficulty met with, and that the use of a straight forceps would render the manœuvre much easier. This advice, given I believe by M. P. Dubois, deserves to be taken into consideration.

In 1850, M. Danyau read a paper before the Academy, in which he gave preference to this operation; he recommended, however, that, unless the straight forceps are used, the curvature of the edges should be turned toward the chin, as was practised by Campion. He claims to have succeeded several times, and even to have delivered children alive.

Still more recently, M. Danyau and myself succeeded in bringing the chin in front by the use of the forceps, the child remaining alive. In this case, it is true that the face had begun to rotate, so that when the instrument was applied it was quite near the right extremity of the transverse diameter. Facts of this nature have so accumulated, of late years especially, that they can no longer be regarded as exceptional; and if the chin corresponds exactly with the sacro-iliac symphysis, especially if it has already undergone a slight movement forward, there is reasonable ground to hope that the spontaneous rotation thus begun will second that impressed by the forceps upon the chin, and the extraction be accomplished with the chin to the pubis, the body, in consequence of the contractions of the womb, having partaken of the motion communicated by the instrument to the head.

It must, however, be remembered that, in direct mento-posterior positions, this excessive rotation is likely to kill the child; and such a case I have already quoted. Besides this, it must especially be borne in mind that, however skilful the operator, it has often proved impossible. Messrs. Dubois, Danyau, Cazeaux, and many others have failed; and Smellie himself, who long since advised bringing the chin forward, was often unable to succeed. On consulting the voluminous record of observations published by Smellie, I have found but four cases in which the face was deeply engaged in the pelvic cavity in a mento-posterior position. In all these cases, he first tried to push up the head, failing in which he applied the forceps. Now in these four cases, he only once succeeded in bringing the chin forward; in one other, he was only able to flex the head with the instrument and disengage the vertex and occiput, the first beneath the pubis; in the remaining two cases, he was obliged to use the crotchet. The latter course was also pursued in a case furnished him by one of his old pupils. Thus, of five cases, did but one permit of rotation forward; it being impossible in all the others.

Are we prepared to say that after rotation forward has failed, craniotomy alone remains? I think not, but believe it right first to endeavor to flex the head by means of the forceps. By so doing I extracted a living child. Smellie also succeeded, after vainly trying to bring the chin forward; and similar cases are to be found in the medical journals. It ought, therefore, to be attempted before having recourse to craniotomy.

In estimating the value of the various modes of procedure which have been mentioned for effecting delivery in these difficult cases, we must not be too exclusive; for experience shows that the plan which succeeds in one case fails in another, without our being able fully to account for the difference; often, indeed, after having tried them all fruitlessly, it is necessary to have recourse to craniotomy.

Especially do I think it necessary to a proper estimate of the utility of each, that great regard should be had, at the time of operating, to the exact relation of the chin with the posterior plane, to the energy of the contractions, and to the tendency which the head may exhibit to perform its rotatory movement. An almost direct mento-posterior position, immobility of the head, and continuance in that position after a long labor, as also the weakening of the pains so often consequent upon great prolongation of labor, are conditions evidently opposed to artificial rotation.

In short, apply the forceps and attempt the rotation, making the efforts coincide with the contractions of the womb; if unsuccessful, try to flex the head; should this fail, perform craniotomy.

3. *When the face is still above the superior strait*, an application of the forceps is only to be attempted when the pelvic version is altogether impossible. In fact, it is well known that the face is then usually found in a transverse position. Besides, as previously stated, when the head is so high up, the blades are necessarily applied along the sides of the pelvis; consequently, one of them would come into contact with the vertex, the other with the neck, and the pressure made on this latter part would most assuredly compromise the life of the child. We were, therefore, right in saying that the forceps ought only to be used as an extreme measure, and that before using it, unless Baumers' forceps are tried, an attempt should be made to convert the face position into one of the vertex by the cephalic version, and then apply the forceps on the head in this rectified position.

§ 5. WHEN THE HEAD REMAINS BEHIND AFTER THE BODY IS EXPELLED.

When the head is retained in the mother's parts, after a natural delivery by the breech, or after the pelvic version, an application of the forceps is rarely indispensable, for the hand alone is usually sufficient to effect the delivery; more particularly in those cases where an extension of the head is the sole cause of difficulty. But when the manual operation has failed, or the base of the cranium is arrested by a contraction of the pelvis, the forceps may certainly be very useful, Madame Lachapelle to the contrary notwithstanding.

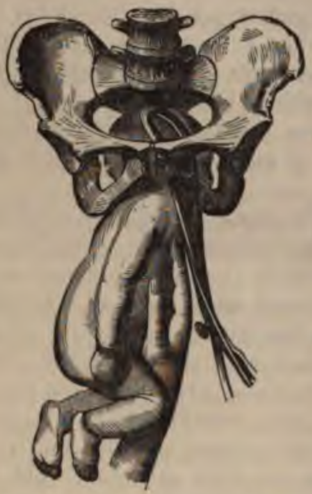
Whenever an application of the instrument is decided upon, the rules for operating are nearly the same as in the vertex positions; here, also, the blades are placed as nearly as possible on the sides of the head, having their concave edges always directed towards the part that is to come under the pubic arch, &c. We may further add, that it should be entered along the sternal plane of the child, as also, that the body is to be supported and carried towards that side where the occiput is situated, *i. e.* directly forward and upward in the occipito-pubic positions, forward and to the left in the left anterior occipito-iliac positions, &c., &c.

The blades having been introduced in the usual manner, we are next, as a general rule, to attempt the disengagement of the head by a movement of flexion, having the nape of the neck as its centre; which is situated at times under the symphysis pubis, and at others at the perineal commissure.

In one case only would the accoucheur be warranted in entering the forceps along the dorsal plane of the child, and freeing the head by a process of rotation. We mean, where the face is above, the occiput being behind; but this manœuvre, which was recommended by Madame Lachapelle, does not always succeed; for other practitioners are not so fortunate as that skilful midwife in turning the face into the hollow of the sacrum. We rather believe, with M. Velpeau, that, relying on the result of the cases reported by Eckard and Michaelis, it might be possible, by means of well-directed tractions, to free the occiput at the anterior perineal commissure, after which the delivery of the head would be completed by its extension.

But a much more difficult case may be met with in consequence of an arrest of the head above the superior strait; whether arising from an unusual extension, incapable of being remedied by Madame Lachapelle's manœuvre, or from a contraction of the pelvis, too inconsiderable of itself to require the use of the forceps. Both Smellie and Baudelocque, who were as skilful as fortunate, have succeeded in its application under such circumstances; but, notwithstanding the great authority of their names, cases of this kind may well be dreaded when such a man as Dewees always failed in the operation! In fact, what a series of difficulties are here met with! Thus, not speak of the obstacle to the operation caused by the trunk filling up the vulvar orifice, we must remark: 1. That, when the head is lodged transversely with regard to the pelvis, as frequently happens, the forward inclination of the upper strait makes it impossible to apply the blades on the sides of the head; 2. That the vertical diameter of the head will necessarily be placed in the direction of the axis of the blades, and that

Fig. 143.



Application of the forceps where the head is retained after the delivery of the body.

the latter will consequently be applied upon the two extremities of a long diameter,—a circumstance tending strongly to defeat the operation; 3. That on account of the elevation and position of the head, it is often imperfectly grasped by the instrument, which is liable, upon the first tractions, to slip and wound the parts of the mother. It is, however, the extreme resource, and must be attempted whenever tractions, as strong as are compatible with the life of the child, have proved unavailing.

The rules for its accomplishment are very simple; namely, to carry the trunk towards the part corresponding with the occiput; to depress the chin as much as possible, with a view of diminishing the extension of the head; to enter the blades on the side of the pelvis; and, lastly, to operate, as far as practicable, in the direction of the pelvic axes.

Should the base of the cranium present after the accidental or designed separation of the head from the body, it would be proper, provided the pelvis were well formed, to apply the forceps, after having taken the precaution of placing the head in a proper position; that is, with the smallest diameters corresponding with the plane of the pelvis, and the occipito-mental diameter with the direction of its axis. Should the deformity be too great, the embryotomy forceps will be the only resource. (See *Craniotomy.*)

§ 6. General Considerations of the Employment of the Forceps.

Although an exceedingly useful instrument when employed by skilful hands in proper cases, the forceps, by being badly directed or improperly applied in those in which it is not indicated, may give rise to the most serious disorders. It is particularly important, therefore, in closing this article, to point out the cases in which it may be advantageously employed. Besides, this short review will serve to illustrate the precepts just given, and render its mode of action more intelligible.

The forceps has been recommended: 1st. In cases of irregular or inclined vertex and face positions, which are neither corrected spontaneously nor can be by the unaided hand. 2d. Where a disproportion exists between the pelvic dimensions and the size of the head, whether dependent on an excessive volume of the latter or a contraction of the former. 3d. Where any accident, serious enough to compromise the life of the mother or child, occurs during the labor, which is not remediable by version. 4th. Lastly, where the head has descended to the pelvic floor, and is there arrested either by the resistance of the soft parts or by the shortness of the cord.

1. *Inclined Vertex or Face Positions.*—As heretofore stated, we consider an application of the forceps preferable to the use of the vectis (or lever) in these cases, after the inefficiency of the natural powers has been fully determined by a delay of seven or eight hours. The retraction of the uterus would render version too difficult. In fact, we believe that a prompt delivery is equally demanded for the benefit of the mother and the child, and that the forceps alone can accomplish this result. Moreover, as the inclined lateral or parietal positions are nearly always transverse, it is unnecessary to add, after what has been elsewhere said, that the blades are to be entered on the sides of the pelvis; and that, as the head descends into the excavation, it will probably undergo rotation, whereby it will be con-

verted into an antero-posterior position.[1] By proceeding in this manner, we will avoid, according to Dugès, the difficulties of a direct antero-posterior introduction as regards the pelvis, and the dangers to the fœtus from a biparietal application; for it must be obvious that, if the inclination were considerable, one of the blades would bruise the upper part of the neck.

2. *Contractions of the Pelvis.*—The ultimate limit to which we restricted the use of the forceps, was three inches; because any reduction we could hope to obtain in the diameters of the head beyond that, would not, as a general thing, be great enough to permit it to pass through the contracted diameter of the pelvis. In truth, the enlarged experience of Baudelocque has proved that, when the forceps is applied in the direction of the biparietal diameter, the greatest reduction attainable, without compromising the child's life, is not more than half an inch. Now, this diameter, on a well-formed head, averages from three and a half to three and three-quarter inches, and even supposing that we can reduce it half an inch, there will still be left three inches at the least.

Certain practitioners, having observed that the head became gradually moulded to the shape and dimensions of the pelvic cavity, by the efforts of the womb alone, in some cases in which the pelvis was contracted to less than three inches, have therefore imagined that the resources of art could accomplish what nature alone sometimes effects; that by the forceps a similar reduction in the diameters of the head might be obtained; and consequently, that the instrument could be usefully applied when the contracted diameters are even less than three inches. But they have instituted a comparison between two forces that are wholly dissimilar. Indeed there can be no doubt that the expulsory efforts of the womb have succeeded in forcing the head through the pelvis where the smallest diameter did not exceed two and three-quarter inches; but this result was only effected after a tedious labor of thirty, or forty, or even sixty hours; and where the slow and gradual compression, to which the head was then subjected, enabled the brain to accommodate itself thereto by degrees. On the contrary, the reduction obtained by the forceps is produced by a force that does not extend beyond half an hour or an hour at the most. Now, everybody knows that a tumor, whose development extends over a period of several years, may exist within the cranial cavity without giving rise to any serious disturbance, whilst a little drop of blood, suddenly effused, brings on paralysis at once. Consequently, the pressure made by the forceps may kill the child by its sudden action, notwithstanding the reduction is absolutely less than what nature herself sometimes produces after several hours of suffering.

---

[1] This phenomenon occurred in a lady, in Rue St. Paul, to whom I was called by Dr. Ducros, about seven o'clock in the evening. The membranes had been ruptured since eight A. M.; the head was situated in a transverse occipito-iliac position, and was inclined on its anterior parietal region; it had not made the least progress since morning, and was so inconsiderably engaged at the superior strait, that I was forced to introduce nearly the whole hand for the purpose of ascertaining the position: the waters had escaped, and I attempted in vain to effect a reduction; but an application of the forceps, made in the manner above indicated, was attended by the happiest results.

The head descended, and rotated within the blades, and in less than five minutes the child was born living.

The lying-in exhibited nothing unusual.

But when the pelvic diameters exceed three inches, the forceps may prove very useful; though I am induced to believe that the character of its action has been misunderstood, by supposing that it is to serve both as an instrument of traction and as one calculated to reduce the dimensions of the head by its pressure. Let it be understood that the forceps merely acts here as an instrument of traction.

In fact, the contraction usually exists at the superior strait, where it is particularly apt to affect the sacro-pubic diameter; and as the head always has a tendency to present its long diameters to those of the pelvis, when retained above, it is generally found in a transverse or an oblique position (more frequently the former). Its biparietal diameter will, therefore, correspond to the smallest one of the strait, and of course the blades of the forceps should be applied in the direction of this diameter; but we have shown that such an application is not possible in any case, and this impossibility is still more evident when contraction exists. For, as Dr. Collins observes, if the sacro-pubic diameter amounts to but three inches, it would be impossible to apply an instrument, the interval between whose blades, when closed, is from three and a half to three and three-quarter inches.

The forceps will therefore have to be applied laterally; but it is evident that the pressure exerted by it will bear upon the occipito-frontal diameter. Now, although the experiments of Baudelocque may have proved that the hĕad, when flattened in one direction, is not very sensibly enlarged in another, it cannot be supposed that a reduction effected in the occipito-frontal diameter would at the same time diminish the biparietal one, which is perpendicular to it. How, then, does the forceps act? Simply by its tractive power, which, conjoined with the uterine contractions, induces the head to engage in the excavation; when, of course, as the parietal protuberances correspond with the anterior posterior diameter, the biparietal one becomes compressed between the pubis and sacrum; the pelvis itself acting here as the compressory agent, and not the forceps, which latter merely facilitates the process by its tractions. The pressure exerted by the instrument would certainly be more hurtful than useful, by preventing whatever elongation the occipito-frontal diameter is capable of receiving during the forcible reduction of the biparietal one. This view of the action of the forceps has at least the advantage of demonstrating the uselessness, if not the danger, of the powerful efforts sometimes resorted to by certain accoucheurs for the purpose of compressing the head, and reducing its size; for when the head is well grasped by the instrument, all that is requisite is to tighten the latter enough to prevent it from slipping during the operation. If the forceps can ever be used as a means of reduction, it is only when the head is arrested by a shortening of the bis-ischiatic diameter.

The limits just assigned to the application of the forceps, are the consequence of experiments upon the dead body, and of the most frequently observed cases; but we shall have occasion to prove hereafter that they cannot be regarded as absolute. When the smallest diameter of the contracted pelvis is less than three inches, we are still almost obliged to try the forceps before having recourse to craniotomy or symphyseotomy (see *Symphyseotomy*), and it has several times been the means of extracting a living child through a diameter of but two and three-quarter inches, for example.

But are the forceps the only resource left before having recourse to a bloody operation in cases of contracted pelvis? We long thought that it was, and, notwithstanding the impression made upon our mind by the perusal of the observations of Madame Lachapelle, we shared on this important practical point the opinion of the majority of French accoucheurs, and proscribed pelvic version in cases of contracted pelvis, except in the oblique oval variety, in which it was admitted by all to have undoubted advantages.

The recent publication of Drs. Simpson and Radfort led us to a fresh examination of the question.

"On reading cases of contraction of the pelvis," says Dr. Simpson, "I was struck with the fact, that the labor in certain malformed females was much easier and more fortunate when the child had presented by the feet than when the head was the first to offer. In several cases even, which would have required craniotomy, the presentation of the feet or pelvic version enabled me to effect the delivery in a succeeding pregnancy. Five observations of this kind are recorded by Smellie."

"According to my tables," says Madame Lachapelle, "of fifteen children delivered by the forceps, on account of contracted pelvis, seven lived, and eight perished; whilst of twenty-five delivered by the feet, fifteen survived." The proportion of success is, therefore, three-fifths for version, and rather less than one-half for the forceps. "These fortunate results of version," adds the illustrious midwife, "are doubtless due to the greater facility with which we are able, whilst drawing upon the pelvic extremity, so to direct the head of the fœtus as to place its transverse diameter in correspondence with the shortened antero-posterior one. When, on the contrary, the head presents first, it is, in fact, generally situated transversely; but it may possibly occupy much more unfavorable positions, and those, too, of a kind which the forceps is incapable of altering."

Supposing the head to be situated transversely above the shortened sacro-pubic diameter, would it traverse the passage with any more ease if presenting the top of the head, than when, after the extraction or spontaneous expulsion of the body, the base of the cranium is presented to the shortened diameter? Here, theory seems to be quite in accordance with the above-mentioned facts. The head, regarded as a whole, represents a cone, whose base is the biparietal diameter, amounting to from three and a half to three and three quarter inches, and the top of the head by the bimastoid diameter, amounting to but from three to three and a quarter inches. This latter diameter is irreducible, whilst the former is susceptible, under the influence of pressure applied for a longer or shorter time, of being shortened to the extent of three-eighths, or even five-eighths of an inch. Now, when the top of the head presents first, the base of the cone which it represents is brought in relation with a shorter diameter than its own, and all the efforts of the womb, as well as the tractions of the forceps, can have but the single result of flattening the vault of the cranium against the opening of the pelvis, and consequently of increasing, instead of diminishing, the biparietal diameter. If, on the contrary, we suppose the cone represented by the head to engage by its point, that is to say, by its bimastoid diameter, the tractions upon the body of the child might have the following effects : namely, if the shortened pelvic diameter presents at least from two and three quarters to three and a quarter inches, it will present no serious obstacle to the engagement of the bimastoid diameter, and from that time, the compression upon the sides of the parietal protuberances, produced by the resisting symphysis pubis and sacro-vertebral angle, tends to force them nearer together, that is to say, to shorten the biparietal diameter, and the head drawn down by the accoucheur will engage in the contracted part of the pelvis like a wedge, the base of which is compressible. In short, the resistance of the bones of the pelvis in the presentation of the top of the head, tends to lessen the occipito-frontal or occipito-mental diameter, whilst in foot presentations, it tends to diminish the transverse diameter, that is to say, the only one which it is important should be reduced. (Simpson.)

A greatly prolonged labor ought, doubtless, be regarded as one of the most dangerous circumstances affecting the welfare of both mother and child, for the lives of both are hazarded in proportion to the lengthening out of the expulsive stage; now, according to Dr. Simpson, version affords the immense advantage of enabling us to terminate the labor more quickly. What, indeed, is the course generally pursued when it is proposed to apply the forceps in these cases of contraction? It is evidently, to wait before acting, in order to determine the incapacity of the uterine efforts, and it is not until after five, six, or eight hours of expectation, that the instrument is used. In the meanwhile, the head is compressed powerfully, and the maternal organs are so seriously contused as to expose them to gangrene, or, at least, to those inflammations of the uterus or of the cellular tissue of the pelvis, so dangerous during the lying-in. On the contrary, when turning is intended, the most favorable moment can be chosen in many cases, which is immediately after the membranes are ruptured and the neck completely dilated. The term of expectation would be still longer in presence of a pelvis so contracted as to require embryotomy; for, unless the fœtus is found to be dead, the operation is deferred until it shall have perished, or at least until the labor shall have lasted so long as to render its viability exceedingly doubtful.

If regard be had only to the interests of the mother, version, as affording opportunity to act immediately after the membranes are ruptured, should therefore be preferred; but is the case the same as respects the fœtus? If we compare the results of podalic version with those of embryotomy, the reply is ready, for the facts mentioned by Madame Lachapelle, and some authors, afford us at least the hope of sometimes saving the child by turning, whilst its death is the inevitable consequence of any other operation. But do not the forceps, within the rational limits which we have fixed for their employment, afford greater chances to the fœtus than the extraction by the feet? Madame Lachapelle and Drs. Radfort and Simpson do not hesitate to declare for the turning. Notwithstanding the facts collected by the illustrious midwife, and whilst admitting with the English accoucheurs, that the compression is less dangerous to the fœtus when exerted on the sides of the head than when its tendency is to shorten the occipito-frontal diameter, we confess that we cannot share their preference when the top of the head presents in a favorable position. The arrest of the base of the cranium above the contraction, the possible extension of the head, the stretching of the cervical region to which the tractions made on the body necessarily expose it, the possible compression of the umbilical cord during the time occupied in the extraction of the child, are, indeed, very unfavorable circumstances for the latter, and, unfortunately, greatly to be feared during version. But when, with a shortened diameter of three and a quarter inches, there coincides an unfavorable presentation, as those of the face or of the trunk, and when, before the application of the forceps, it is first necessary to perform the cephalic version; or when, the top of the head presenting, it is so situated that its longitudinal diameter corresponds to the contracted one, we are of their opinion, and prefer version to the use of the instrument.

When the antero-posterior diameter of the pelvis amounts to but from two and three-quarters to three and a quarter inches, and the child, being still alive, is placed in the conditions just mentioned, we also think that version should be preferred.

If, after several fruitless attempts made with the forceps upon a favorably situated head, the heart is heard to beat distinctly and regularly, we should, if the pelvis has at least two and three-quarter inches, attempt the pelvic version before resorting to craniotomy.

We would add, with Madame Lachapelle, that version is also preferable to the use of the instrument, when the inferior strait is contracted transversely, and the pubic arch is narrow and angular. When, in fact, the head is the first to be delivered, the occiput appears first beneath the pubis, and its disengagement under these circumstances is very difficult, and sometimes even impossible. When, on the contrary, the extraction takes place by the feet, the occiput places itself behind the pubis, the forehead is the first to appear in front of the perineum, and only the *back of the neck* engages in the arch of the pubis.

[Our colleague, M. Joulin, expresses a much more positive opinion. He insists that turning ought to be rejected and the forceps preferred whenever they can be applied, except in cases of obliquely deformed pelvis. In his paper (*On the Forceps and Version in Contractions of the Pelvis*) are recorded experiments of undoubted value, made upon the dead body; yet it was a great mistake that, in an account in other respects very well prepared, M. Joulin should have supposed the previous editions of this work (Cazeaux, 1858) to contain inconsistencies in reference to the subject under consideration. To know that the charge is unfounded, it will only be necessary to consult the full text in order to ascertain its true meaning. To it we refer the reader who would judge for himself. The apparent contradiction is really but an expression of reserve in the judgment given.]

To recapitulate: when the pelvis has at least two and three-quarter inches in its sacro-pubic diameter, the forceps should be used if the top of the head presents in a transverse position. The pelvic version should be preferred: 1, in direct antero-posterior positions; 2, in inclined or irregular positions of the top of the head; 3, in face and trunk presentations; 4, in contractions of the inferior strait attended with narrowing of the sub-pubic arch. It were useless to recall the important distinction which we have established for the oblique oval pelves, in which version is the rule.

3. *Accidents.*—It is only necessary to recall the conditions in which version is practicable, to show the part the forceps may play in those accidents that require a speedy termination of the labor. We need not mention the dilatation or dilatability of the os uteri, for this is indispensable to both operations. Should a completion of the delivery be deemed imperative, when the head has cleared the cervix, or is low down in the excavation, we would apply the forceps; but, on the contrary, if it be but little or not at all engaged at the superior strait, version would be preferable, unless the pelvis was very narrow, or the womb was so firmly contracted as to render an introduction of the hand unusually painful, or even impossible.

4. *The Resistance of the Perineal Muscles* is one of the most common reasons for resorting to the instrument; for nine out of every ten applications of the forceps are made for the purpose of extracting the head, which has been detained at the pelvic floor for four, five, six, or seven hours; indeed, if the measures recommended on page 678 have proved ineffectual, this is our only resource. But, even here, it is possible that obstetricians have been in error with regard to its modus operandi, since every one, who, like myself, has frequently had occasion to apply it, must have been struck with the fact of how little effort is required, under such circumstances, to effect the delivery of the head. For, where this part has been retained at the same point for seven or eight hours, notwithstanding the most energetic contractions of the organ, and all the uterine forces have been expended on an apparently insurmountable obstacle, the accoucheur, in resorting to his instrument, may anticipate the necessity of using some considerable force; and yet, as soon as a few slight tractions are made, this great resistance seems to give way at once, the uterine contractions that were so long ineffectual are henceforth adequate, and the patient soon expels the head and forceps together. Far different would be the result, if the arrest of the head were altogether dependent on an over-resistant perineum; for the exertion requisite in those cases, where this part has been rendered less extensible by abnormal bands or cicatrices, is well known. Doubtless, this resistance from the pelvic floor is the first source, but it is far from being the whole cause of the difficulty.

In my opinion, the following is the true state of the case: when the head, urged on by the uterine contractions, reaches the floor of the pelvis, it is already in a state of flexion, which must certainly increase as the pains become stronger, and the perineum more resistant; for, being placed between two opposite forces, it will necessarily be flexed on the chest to the greatest possible extent. Now, it is this excessive flexion that constitutes the most serious difficulty, for, in this position, the spinal column abuts directly on the occiput, and every expulsive effort transmitted by it has a tendency to depress the latter, and to flex the head; but here its extension can alone effect a delivery. The question recurs, how then does the forceps operate? I answer, in a very simple manner: by the first tractions it extends the head, changing this part to a more favorable position relatively to the spine, and thus restores the efficacy of the uterine contractions, which latter are quite sufficient for the subsequent completion of the delivery.

Hence, the reader will understand that, although the perineal resistance is, without any doubt, the original cause of the arrest of the head, yet, in a vast majority of cases, it merely acts by producing an exaggerated flexion; and that, as soon as this is created, it alone constitutes the whole difficulty; a proof of which is satisfactorily afforded by the ease and rapidity of the termination of the labor, after the first moderate tractions made by the instrument have effected a partial extension.

5. Lastly, it has been shown how a shortening of the cord may become a cause of dystocia. Where this happens, the forceps is a hazardous resource, that ought to be avoided; but the real source of the delay is generally unknown, and, even if it were not, I know of nothing better to be done, if the head is low down in the excavation.

The period of labor for applying the forceps varies with the cause that demands its use. When any accident whatever renders it advisable to produce a speedy delivery, and the forceps be deemed appropriate, the time for operating will be judged of by the danger of the accident itself; for we are evidently to interfere as soon as there is reason to fear that the life of either the mother or child is involved. When the head is arrested above the superior strait by a contracted pelvis, we might wait in ordinary cases, as elsewhere stated, for six, seven, or even eight hours after the membranes are ruptured and the os uteri is fully dilated; but a longer delay would expose both mother and child to the most serious hazard. Again, when the arrest of the head is dependent on the resistance of the soft parts, the pressure thereby created on the vaginal walls and sometimes even upon the parietes of the womb, might eventually determine a gangrene of those parts, and render the patient liable to the vesical and recto-vaginal fistulas, which often result in consequence. Besides which, the fœtus, being subjected for a long time to compression, may suffer from it, and from the disorder thereby created in the omphalo-placental circulation; and the uterus, having exhausted its energy against resistances which it cannot overcome, falls into a state of inertia that continues after the delivery, and becomes then a source of hemorrhage; and, lastly, the inflammation of the womb or vaginal walls that occasionally takes place, may extend to the peritoneum after, or even during the labor, and speedily prove fatal. All these dangers are easily obviated by the proper application of the forceps; and though, on the one hand, the abuse of the instrument, by employing it too early, as some practitioners are in the habit of doing, is to be avoided, yet, on the other, we must not virtually interdict its use by trusting too long to the powers of nature. We must again allude to what was previously stated in regard to the importance of observing the stage of the labor at which the delay occurs; thus the time that has elapsed prior to the rupture of the membranes, can have but little influence on the mother's condition, and none on that of the child, so that, even where the labor has lasted from thirty to thirty-six hours, there is often nothing to be done; though if the head were low down in the excavation, and it had made no progress for seven or eight hours, the forceps ought to be applied. But this rule, which is applicable to most cases, admits of some exceptions; and it would seem useless to add that the state of the patient's health, the strength or feebleness of the uterine contractions, the slowness and intermission, or the regularity of the fœtal pulsations, &c., must influence the time of its application. The accoucheur would be justly liable to censure for not acting soon enough, and equally so for recurring too early to the use of instruments.

Statistics, and General View of the Operation.—We find the same difficulty in forming an exact idea of the frequency of the cases requiring the application of the forceps, as we did of the cases demanding version, for they vary much in different countries, and even in the practice of accoucheurs of the same locality. Thus, on consulting the statistics collected by Churchill, we find for England, 120 forceps cases in 42,196 labors, or about 1 in 351; whilst in France, the instrument has been used 277 times in 44,776 labors, or about 1 in 162; and in Germany, 1702 times in 261,224 labors, or about 1 in 153.

It is still more difficult correctly to estimate the danger of the operation to the mother and child, for the statistics generally represent only the number of mothers and children who perished, without stating the cause requiring the intervention of art, and, consequently, leaving us uninformed as to the probable danger of the operation in any given case. Thus, the risks to which the mother and child are subjected when the use of the forceps is demanded only by the resistance of the soft parts, is not comparable to that which threatens them when the head is arrested by a contraction of the pelvis. The length of time which elapses between the discharge of the waters and the intervention of art, necessarily influences greatly the result of the operation: now, with the exception of Dr. Collins, whose statistics, though unfortunately too limited, prove that the mortality is greater in proportion to the lateness of the operation, very few authors have noted this particular point.[1]

There can be no doubt that the use of the forceps increases the dangers of the delivery.[2] Besides its being always prejudicial to interfere with the operations of nature when they are going on regularly, the application of the forceps, though apparently of the simplest character, may prove dangerous to the mother, and especially to the fœtus. The too rapid depletion of the uterus exposes the woman to hemorrhage from inertia. The dilatation of the soft parts takes place with far less regularity when the head is extracted by the forceps, and the perineum is, therefore, much more liable to laceration, however carefully the tractions are performed. Finally, I shall not speak of the lesions of the cervix and of the perforation of the vagina, since it is always possible to avoid them by conforming to the precepts already given.

---

[1] Dr. Collins gives the following as regards the mothers. When the labor was terminated in 24 hours, but one woman died out of 13; between the 23d and 30th hour, there was one death for 6 cases; between the 37th and 48th, one death in 4; and beyond 48, one death in 2 cases.

[2] In natural labors, the mortality was, for the mothers, 1 in 346, and for the children, 1 in 31; in deliveries by the forceps, it was, for the mothers, 1 in 22, and for the children, 1 in 43.

Therefore, the instrument should be had recourse to only when the insufficiency of the powers of nature shall have been well ascertained, and we are convinced that a longer expectation would be injurious to the mother or to the child.

The posterior position of the head, when the vertex presents, also adds to the difficulties and danger of the operation. Especially when the occiput is directly behind, or behind and to the left, is the operation more laborious. I have mentioned a case of direct posterior position in which I was obliged to bring the occiput forward (page 974, note). In two other cases of left posterior diagonal position, the head was delivered only by the strongest exertions. The occiput in these cases pressed so strongly upon the sciatic plexus, that both the patients suffered, for a long time after, great pain in the course of the sciatic nerve, and one was unable to walk for more than a year.

On the other hand, the compression of the child's head by the instrument may be prejudicial to its health or even to its life, and we have to point out as possible occurrences, cerebral effusions, fractures, and depressions of the bones of the skull, exophthalmia, contusion, laceration, and separation of the scalp, compression of the umbilical cord between the head and the blade of the forceps, and, lastly, paralysis of the facial nerve, on which we shall make some remarks.

Quite recently, M. Landousy has called attention to the facial paralysis of new-born children, that often follows an application of the forceps; and M. P. Dubois has also alluded to the same fact in his lectures. This palsy, which affects only one side of the face, is caused by the pressure of the blade on the seventh pair of nerves. Owing to the nearly total absence of the mastoid process, and the defective development of the auditory canal, such a compression of the facial nerve just as it escapes from the stylo-mastoid foramen may occur very easily. The affection is easily recognized immediately after birth, by the following circumstances: the commissure of the lips is drawn out of place; the nostril is neither so dilated nor so movable as its fellow of the opposite side; the eyelids are open, while those on the sound side are closed; the whole side of the face is distorted, and this deformity, heightened by the infant's cries, gives it a very peculiar expression. As soon as the crying is over, the deformity is so slight as scarcely to be noticed, if the eye on the sound side happens to be open; but when the child cries again, the want of symmetry in the features is once more observable. This difference in the phenomena of the disease, dependent on the condition of repose or agitation of the face, is much better marked than it is in the facial hemiplegia of adults. The difference is particularly striking just before it cries, for its face then exhibits alternations of rest and excitement such as those just described. In the course of a week or ten days these symptoms nearly all disappear, and the equilibrium between the two sides is gradually restored. When the compression of the nerve has been moderate, the hemiplegia does not last so long, and occasionally disappears in a few hours; but in other instances it may persist for a month or two. Hitherto, this affection has never terminated in death, having always passed off, even where no active medication has been employed.

The only precautions necessary in such cases, are to protect the eye from the light; and, when sucking is interfered with by the paralysis, as it occasionally is, to find a nurse having a well-formed nipple.

CHAPTER V.

OF THE VECTIS.

THE vectis (or lever), which Burns proposed calling the *tractor*, was formerly much used, though, at the present day, it is scarcely ever resorted to, since, in nearly all the cases in which it has been recommended, the forceps may be advantageously substituted. It was employed to effect the correction of the head in cases of inclined vertex presentations, to depress the occiput in face positions, to force the head to descend, and to free it from the genital organs. It was probably devised at about the same time as the forceps, and if Roonhuysen was not really the inventor, he was, at any rate, one of the first to use it, and through his example it soon acquired a great reputation. But the vectis has undergone numerous modifications since it became public. The one now in use resembles a branch of the forceps; the blade is provided with a fenestra, and is curved on one side so as to adapt itself to the convexity of the child's head; being terminated below by a long flat stem, which becomes narrower and rounded, so as to fit in a wooden handle, which latter is either continued out in the same line, or else is slightly bent in the opposite direction from the blade.

We agree with Dr. Coppée, that if the lever is to be used at the superior strait, it ought to have a very slight curvature, for if it were otherwise constructed, the difficulties which would be met with in its application might be charged to the method when, in fact, they were due to the form of the instrument.

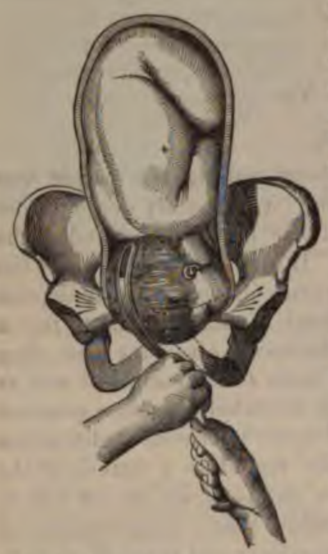
[The lever is to be introduced in the same way nearly as a blade of the forceps. The bladder ought first to be emptied, a precaution even more necessary than when the forceps is used. The woman ought to lie across the bed, and very horizontally, the latter position being regarded by the advocates of the vectis as highly important.

The instrument being warmed and greased, the hand or a few fingers are to be passed into the vagina, in order to guide the blade to the head of the child. The operator takes the handle of the instrument in the other hand and passes the blade into the vulva. The blade may be placed at once in front, just where it is intended to apply it, though we think that it would be better to observe the same plan as with a blade of the forceps, that is, first to direct it backward until it reaches the sacro-sciatic ligament, and then give to it a spiral motion which brings it more or less toward the front according to circumstances. When properly applied, the vectis will always be found at last behind the most anterior segment of the pelvis and in relation with the body of the pubis, for it ought always to act upon the head from before backward.

It is of the first importance to be sure of the presentation and position, inasmuch as the instrument ought never to be applied except to the bony parts of the head, as the occiput, temple, or mastoid apophysis, the occiput or mastoid region being the parts which offer the greatest advantage.

The choice of the side of the pelvis upon which the vectis shall be applied will depend more especially upon the position of the occiput and the movements which the accoucheur wishes to impress upon the head, in accordance with the mechanism of natural labor. In anterior and transverse occipito-iliac positions, for example, the blade ought always to be passed to that side of the pelvis where the occiput is situated, so that it may be applied to it, draw it down, and turn it to the side of the pubis. We shall have occasion to revert to this subject hereafter.

FIG. 144.



Mode of using the lever to pull down the occiput, or to flex the head.

The vectis ought not to be passed in too far, as it might come in contact with the face or sides of the neck and occasion serious mischief. About three inches would be far enough to bring it to the part upon which it is to act.

When the instrument is properly placed, the handle is to be raised, and the arch of the pubis serving as a fulcrum, it acts as a lever of the first kind. The head is then depressed by the power at the handle, and by drawing downward at the same time that this action of leverage is performed, is finally delivered.

To prevent injury to the urethra, the lever should be wrapped with a piece of linen or gum-elastic and placed a little to one side of the median line; but when applied in the way we have just described, it slips very easily, producing more or less contusion of the parts overlying the ischio-pubic ramus. To prevent all these inconveniences, the instrument ought to be held firmly at its middle by the left hand, so as to prevent slipping, at the same time that it is pressed strongly backward to strengthen, as it were, the fulcrum and lessen the pressure against the arch of the pubis.

The use of the vectis has been alternately depreciated and immoderately praised. It was strongly condemned by Baudelocque, and is at this moment so little known in France that our present classic authors devote barely a few lines to an account of it. This indifference to an instrument which has numerous partisans in Belgium and Holland seems to me unreasonable; and we also find that some French authors think better of it: Desormeaux, for example, who tells us that he used it successfully in two cases in which it would have been difficult to apply the forceps.

The subject is an important one, and I propose, in treating of it, to avail myself of the theoretical views and clinical facts which abound in Boddaert's excellent paper. I myself witnessed a case which convinced me that the vectis may sometimes be used with the greatest advantage, and sometimes even successfully when the forceps has failed.

In 1863, Professor Fabri (of Bologne), who wrote an important paper upon the vectis, being at Paris, I made some experiments with him upon the dead body. A contraction of the pelvis having been imitated by fixing a plate of sheet-iron upon the promontory of the sacrum, and a fœtus placed as though it presented by the vertex, I applied the forceps, but was unable, with all my strength, to bring it into the cavity of the pelvis. Dr. Fabri then used his lever, and immediately brought it into the excavation.

The experiment was repeated. I applied the forceps again, but with no better success; taking then the lever, I have to assert that I accomplished my object with wonderful ease. It will be admitted that a result of this kind merits attention.

If comparison be made between the lever and the forceps, it will be found that they act differently. The forceps is an instrument for traction, and, in this point of view, is far superior to the vectis. That the head may be extracted by the latter cannot be doubted, for the facts are there to prove it; still, its power in this respect I regard as far inferior to that of the forceps. The lever acts, on the contrary, by compressing the head from before backward, and when compression in this direction is desirable, it would seem to have the advantage of the forceps.

Is not the exclusive use of one or the other calculated to deprive us of a powerful instrument? The vectis is not intended to supplant the forceps, but may be used in certain cases which it is important to determine, inasmuch as the surest way of exciting doubt of its utility would be to employ it without discretion. We shall, therefore, study the action of the vectis in, 1, presentation of the vertex; 2, in presentation of the face; 3, in presentation of the breech, when, the body having been expelled, the head remains in the genital parts.

Of the Vectis in Vertex Presentations.—We shall consider its use successively at the inferior strait, in the cavity of the pelvis, and at the superior strait, because the results to be obtained by it vary with each of these three conditions.

When the head, being at the inferior strait, is arrested by inadequacy of the expulsive efforts, or by too strong resistance of the perineum, the forceps has the very great advantage of acting as a powerful extractive agent in consequence of its enabling the operator to follow with it the central axis of the genital passage. In this respect the forceps is free from all reproach, and is far preferable to the lever which would have the bad effect of crowding the head toward the coccyx and removing it from the centre of the vulva. Besides this, it is liable to occasion laceration of the perineum, which is stated by all operators to be of frequent occurrence under these circumstances. There is nothing, then, to recommend the use of the lever at the inferior strait. We have but one reservation to make in favor of those rare cases of transverse contraction of this strait in consequence of the approximation of the ischio-pubic rami or of the tuberosities of the ischia, the use of the forceps being rendered difficult under these circumstances by the narrowness of the pubic arch, whilst the tractions direct the head too far forward. The lever, on the contrary, has the advantage of being easily applied in consequence of its small size, and at the same time by pressing the head backward, directs it towards the part of the pelvis which has not undergone contraction. Herbiniaux and Boddaert mention cases which seem to prove that, though under these circumstances the lever may be useful, it is the only case in which it has the advantage of the forceps at the inferior strait.

When the head is in the cavity of the pelvis, the forceps will still be almost always preferable for the same reasons. Nothing, in fact, can be more rational or easy than with it to turn the head to the proper direction, and then extract it in the direction of the pelvic axis. We have no doubt that the lever would be less efficient, and, especially in occipito-posterior positions, even hurtful, because when passed behind the pubis it might come in contact with the face and particularly with the eyes, and cause great mischief. Boddaert, however, used the vectis successfully in the pelvic cavity, but recommends it chiefly when the head is extended and the anterior fontanelle is near the centre of the pelvis. According to him, the forceps applied upon a head in this position would hold it so and cause it to engage with its unfavorable diameters, whilst the lever applied upon the occiput brings it down and causes the chin to approach the breast. In exceptional cases this procedure may be useful, but we think that in by far the greater number the forceps should be preferred when the head is in the cavity of the pelvis.

At the superior strait, on the other hand, the vectis would seem to have an undoubted advantage over the forceps. That we may judge of this with a full knowledge of the reason why, it would be well, in the first place, to remember how the head presents at the superior strait, and how the lever and forceps are capable of acting upon it.

The head presents at the superior strait: 1, in an oblique or transverse direction; 2, it is imperfectly flexed as yet, and the occipito-frontal diameter coincides with the opening of the abdominal strait; 3, the direction which it has to follow, in order to descend into the pelvic cavity, is parallel to the axis of the strait, and consequently oblique from above downward, and from before backward. We would add, that all these conditions are exaggerated in contractions of the pelvis, which are one of the most common causes of dystocia, and, consequently, of surgical intervention.

If the forceps be applied under these circumstances, it is impossible to act otherwise than in direct contravention to all the indications. Thus: 1, the blades have to be applied to the sides of the pelvis, inasmuch as at that elevation it is difficult to place them obliquely; consequently the head is seized from the forehead to the occiput, in the direction of its longest diameter, which would make the extraction difficult; 2, the pressure of the branches together, in order to secure a firm hold, fixes the head and hinders the movement of flexion; 3, it is impossible to draw in the proper direction, and the head, instead of being brought down according to the axis of the strait, is always directed too much in front. We would add, that all these disadvantages are increased when the pelvis is contracted, and that it is often difficult or impossible to apply the second branch; besides this, the lateral compression of the head lengthens it from before backwards, which is precisely the direction of the antero-posterior diameter, the most contracted part of the pelvis.

The lever has the advantage over the forceps of being smaller, consisting, as it does, of but one blade. Besides this, its mode of action is entirely different; it presses only upon the occiput, which it tends to bring down, and, consequently, to increase the flexion. When applied behind the pubis, it also compresses the head from before backward, which is the direction of the obstruction to be passed, whilst it elongates it in the direction of the transverse diameter, which is not shortened.

These views seem to us both important and true. They are also confirmed by clinical observations, of which Boddaert's paper alone contains enough to be convincing, showing as they do, that labors rendered difficult from contracted pelvis have been successfully terminated by the vectis after the forceps had failed. "It is, therefore, only through a blind obstinacy that almost all the partisans of the forceps continue to use that instrument and reject the lever, which might be used so much more effectually. An accoucheur might be excused for this exclusive preference of the forceps if the affair were one of no consequence; but as it often happens that when it is used first, the woman cannot be delivered with it, and that both she and the child are in the greatest danger of death, it becomes impossible to adduce plausible excuses for the conduct of those who will persist in the immolation of so many victims." (*Boddaert.*)

The advantages of the lever are most evident when applied at the superior strait, and in cases of contracted pelvis; and we have seen how it fulfils all the indications. Its powerful action cannot be questioned, for in some cases it is found that the head plunges suddenly into the cavity of the pelvis with a peculiar crackling sound, indicative of the depression of the cranium upon the sacro-vertebral angle.

In applying it at the superior strait, the general rules should be observed, placing the blade upon the occiput in anterior occipito-iliac positions, and upon the mastoid region in transverse positions. In these cases the manipulation of the instrument is very simple. The difficulty increases in posterior occipito-iliac positions, for there is then some danger of wounding the face when the lever is applied in front. Here it is necessary to act carefully, acquiring an exact knowledge of the relations of the head to the various points of the pelvis, and then place the blade upon the frontal region, which is next to be pressed backward in order to bring the occiput in front. Let us take, for example, a right posterior occipito-iliac position; here the lever should be applied upon the left temple, in order to press the forehead backward and to the left, whilst the occiput turns from behind forward, and approaches the pubis.

When the head is once brought down into the excavation, it can, doubtless, be extracted by means of the lever; but, as we have already said, the forceps answer better, and in a case of the kind we would not hesitate to use both instruments successively.

Though we are disposed to believe that the vectis is capable of being very useful, some difficulty in its application must be looked for. In the first place, we would mention the mobility of the head above the superior strait, which makes the instrument liable to slip when the handle is raised, or the head to recede when pressed upon by the blade. Whoever uses the vectis in a contracted pelvis will recollect, also, that it is impossible to deliver below certain limits, and that attempts to do so at all hazards with the instrument must not be persisted in. Too forcible or too long-continued manipulations expose the woman to ruptures, vesico-vaginal fistulas, and endanger her life; the risk, in short, being almost the same for both lever and forceps.

The Lever in Face Presentations.—Ought the forceps or lever to be used in face presentations? We would reply that each case requires a separate answer, and that the principles which have guided us in the use of these instruments in vertex presentations, are also applicable to those of the face.

When the face is arrested at the superior strait, and especially when its progress is impeded by contraction of the pelvis, the lever may be preferred as in a vertex presentation, because it directs the head more in accordance with the axis of the strait, and reduces its volume from before backward, which is the direction of the shortest diameter of the pelvis. The forceps are liable to the same objection as in vertex presentations, to which may be added the fact, that, as the head is situated transversely, the placing of the forceps upon the sides of the pelvis would grasp it in an unfavorable position, and that, as one of the blades would be applied upon the front of the neck, the pressure there might be dangerous.

If the lever be preferred, the same rules should govern its application as in vertex presentations; therefore it ought to be applied above the face, with particular care to avoid compressing it; it must also be passed higher up, in order to place it upon the sides of the cranium or upon the occiput; finally, the head, through its agency, should be caused to undergo the same movements which it experiences in natural delivery.

When the face is in the cavity of the pelvis or at the inferior strait, the lever has no advantage over the forceps; it would even be dangerous when the chin is toward the front, because, if applied under the pubis, it would come in contact with the chin or with the neck of the child. It might, indeed, be used in posterior mento-iliac positions, with the view of turning the head in the pelvis and bringing the chin in front; but except in this particular case, the forceps should be preferred.

Application of the Lever upon the Head after the Body has been Delivered.—In breech cases, or during turning, it often happens that the child perishes in consequence of arrest of the head at the superior strait or in the cavity of the pelvis. Generally, well directed efforts with the hand are sufficient to overcome the difficulty; but no time is to be lost, and, if unsuccessful, the use of the lever or of the forceps is to be thought of. We state at once, that the forceps has the disadvantage of having two blades, which are applied with difficulty on account of the presence of the trunk; the advantage of the lever is, that it has but one blade.

Under these circumstances, Dr. Coppée declares himself in favor of the lever. "I have learned," he says, "its merits through its practical application. It has been my fate to see children perish because the hand was unable to extract the head soon enough to save them. Reflecting on these cases, and remembering the good results which I had derived from the use of the lever in the various positions of the vertex and of the face, I conceived the idea of using it also after the body had been delivered, provided there should be any difficulty in the disengagement of the head. I was successful beyond my expectation. Every one will admit that rapid action is necessary in these cases. If the pelvis is well formed, try the manual process advised by authors; but if not immediately successful, have recourse to the lever without further loss of time. In cases where it is necessary to drag for a long time with the hand, the least effort with the lever suffices to extract the head; and in difficult cases, on account of contracted pelvis, the use of the instrument is most effectual." (Coppée.)

This method will doubtless be welcomed by the partisans of version in cases of contracted pelvis.

The operation is conducted according to the general rules: the woman lying across the bed, the body of the child is depressed towards the perineum, and in the meantime the vectis is slipped behind the pubis.

The conduct to be pursued is nearly the same, whether the head be at the superior strait or in the cavity of the pelvis. If the occiput be directed transversely or in front, the instrument should be applied either upon it or upon the mastoid region. But when the forehead looks toward the anterior arch of the pelvis, there is danger of wounding the face, and the temple is then the part to be acted on; remembering that the further the instrument is inserted, the less will the face be exposed to injury. The head, under these circumstances, has a position the reverse of that which it has in vertex presentations; so that, when the lever passes rather deeply, it goes beyond the face and applies itself either upon the forehead or upon the sinciput. Here, again, is the natural labor to be imitated and the forehead sometimes to be pressed backward, so as to roll it into the hollow of the sacrum, and sometimes to be brought directly down under the arch of the pubis. The state of flexion or extension of the head will indicate which course it is best to pursue.

When the head has reached the inferior strait, and, most especially, when it is arrested merely by the resistance of the perineum or vulva, the hand ought to be sufficient to complete its extraction; but if not, the forceps should be preferred to the lever.]

CHAPTER VI.

INDUCTION OF PREMATURE LABOR.

The title of *premature artificial delivery* is applied to a labor that is designedly brought on prior to the ordinary term of pregnancy, but not before the fœtus is viable.

No obstetrical operation has ever been more warmly or more profoundly criticised than this. In fact, it has been supported or condemned by the leading accoucheurs of all countries, and as a consequence of this disagreement among the masters of our art, no part of obstetrical science has ever been studied with greater care. To trace out the first dawning of the induction of premature labor, we should have to go back through the gropings that characterize all human works, to the manœuvres of Aspasia, to the forced dilatations of the os uteri recommended by Louis Bourgeois and J. Guillemeau, or to the more gradual procedure of Puzos. But, in all of these methods, the principle differs wholly from the operation under consideration; for, "in a *premature* delivery, nature accomplishes nearly everything, art merely contributing a slight though certain impulse; whilst in the *forced* labors, art acts almost alone, for all that nature yields must be drawn from her by continuous efforts." (*Ritgen.*)

Under this important distinction, we believe there can no longer be any doubt that the induction of premature labor had its origin in England. According to a few writers, Mary Donally, a midwife of that country, first performed it in 1738; but most of the English authors look upon this as a gratuitous assertion. The judicious Denman states "that, about the year 1756, there was a consultation of the most eminent men at that time in London, to consider the moral rectitude of, and advantages which might be expected from, this practice, which met with their general approbation. The first case in which it was deemed necessary and proper, fell under the care of the late Dr. Macaulay, and it terminated successfully." His example was soon followed by numerous imitators.[1]

From Great Britain, this operation shortly passed to Germany, where it was proposed by A. Mai, of Heidelberg, in 1799, but Wenzel first put it in practice in 1804. Owing to his success, and the publication of Reisinger's remarkable work, it has since been supported by numerous and zealous partisans. It has been performed a number of times in Holland by Salomon, Welenbergh, and Schow; Lovati has been equally fortunate in Italy; and the periodical works of Denmark, of America, Switzerland, and Poland, have severally reported interesting cases of delivery before term.

In France, the reception of this operation into practice is quite modern; indeed, for a long time prior to its admission as a valuable resource, it was rejected as a crime. Roussel de Vauzesme proposed it as early as 1779, though it then received but little attention. It was imperfectly understood for a very long period, and we may doubtless attribute the blind and passionate opposition of Baudelocque and his pupils to their want of a clear and definite idea of what might be expected from its employment. Foderé, however, persisted in recommending premature delivery, on several occasions, notwithstanding the anathemas of this celebrated school. In 1830, M. Burchardt, in a remarkable thesis on this subject, sustained its propriety at Strasbourg, and, finally, in 1831, Professor Stoltz performed the operation for the first time in France, and with the most perfect success. Since then, all doubts have gradually vanished, and most of the French accoucheurs have at length adopted a practice, which has now, for nearly a century, rendered such important services to humanity.

---

[1] The first idea of the induction of premature labor is found in Raphaël Moxius (Liv. II., chap. 16, p. 495); he recommends the provocation of labor with the object of saving the mother, at two different periods of pregnancy. In the first months, before the fœtus becomes animated, and in the last two months, because then "fœtus etiam si per vim ab utero extrudatur, vivere tamen potest, aut saltem non defraudatur vita animæ, quia vivus nascitur et baptizari potest."

[In 1832, two years subsequent to Burkhardt's thesis, Dezeimeris, in an article published in the *Dictionary in thirty volumes*, defends in his turn the induction of premature labor in cases of deformity of the pelvis; making reservations, however, in respect to other indications for the operation. M. P. Dubois, in his thesis for the Concours, (1834,) also recommends the same practice in certain cases of contracted pelvis, and in 1840 he presented to the Academy of Medicine the amount of a mother upon whom he had carried his views into effect with entire success. Since that time, his numerous pupils at the Hospital of the Clinique have witnessed many similar operations. In 1847, Professor Dubois also published a work upon the propriety of inciting labor in certain cases of disease during pregnancy. Since that time, many papers have appeared on this subject, and numerous theses been defended before the Faculties of Paris, Strasbourg, and Montpellier. We would mention, as amongst the most meritorious of the latter, those of M. W. Lacour and Lazare Sée, which contain documents both numerous and important. At present, everybody is well satisfied that premature artificial delivery is one of the finest operations of obstetrical art, and that its use will become increasingly frequent.]

Being once rid of the question of its morality, which for so long a period deterred some practitioners, who did not hesitate about the Cæsarean operation or symphyseotomy,[1] we have only to resolve, at the present day, the two following questions: In what cases is premature labor to be induced? And which is the best method of effecting it?

ARTICLE I.

CASES REQUIRING A PREMATURE DELIVERY.

A. When summing up the indications presented by the pelvic deformities, it was stated that premature labor might be brought on where the smallest diameter of the pelvis did not exceed three and three-quarter inches, and where it was not less than two and a half inches; but we must now explain this proposition more fully.

It should be remembered that this operation is always resorted to for the double purpose of saving the child's life, and of preserving the mother from a danger which very frequently threatens her own existence. In other words, it is not to be attempted until the pregnancy is so far advanced that the viability of the fœtus is fully established, and only in those cases where the contraction of the pelvis is such that delivery at term is wholly impossible without performing either a bloody operation on the patient, or mutilating her child.

The French law, which has been constructed with a view of meeting all possible anomalies, has decided that the end of the sixth month is the period at which a fœtus might be considered viable; but, laying aside some rare exceptions, which ought not to be brought in question, every practitioner well knows that the fœtus seldom lives if born before the end of the seventh month. Consequently we should not think of determining its premature expulsion before the full term of seven months. Although this point is

[1] It is really wonderful that the consequences of this operation have been so long dreaded; since, in two hundred and fifty cases collected by M. Lacour, in the commencement of 1844, more than one-half of the children survived, and scarcely one woman in sixteen died. Let any one compare these results with those furnished either by symphyseotomy or by the Cæsarean operation.

easily decided, so far as the interests of the new being are concerned, yet with regard to the mother such is not the case; for the mere assertion that this operation is to be performed whenever it is known that a natural delivery at term will be impossible, is altogether too vague and uncertain for a question of such importance; and therefore the two following points are to be established with the greatest possible precision; namely, 1st, the degree of contraction beyond which the provoked delivery is no longer practicable; and, 2d, within what limits its employment is justifiable.

As the operation is only admissible after the seventh month of gestation, we must of course ascertain what is the length of the various diameters of the head at that period; because the extent of the biparietal diameter, which in most instances corresponds to the contracted one of the pelvis (the antero-posterior), will evidently show to what ultimate degree of pelvic contraction delivery is still possible. Now, it appears from the researches of Dubois, of Stoltz, and Madame Lachapelle, that the biparietal diameter at the end of the seventh month averages from two and a half to two and three-quarter inches; in addition to which, we may hope for a further reduction of one-fourth of an inch, on account of the compressibility of the head. Therefore, the smallest pelvic diameter must be two and three-quarter inches at the least. This, then, is the extreme limit beyond which the induction of premature delivery is no longer to be thought of as affording any chance of success.

[A few cases of deliveries having been effected through a contraction of two and a quarter inches (see page 646), rare and fortunate as they are, would seem, however, to prove that the limit mentioned above may be extended to two and a quarter inches. I am aware that exceptional facts do not justify the relinquishment of general rules, yet I think that pelves contracted to two and a quarter inches, call for the induction of premature labor; if, when this is done, it be still impossible to deliver the fœtus alive, embryotomy is the last resort, and will be more easily performed on account of the imperfect development of the child.

Below two and a quarter inches, premature labor ought not to be thought of, unless as preliminary to the easier accomplishment of embryotomy. It now remains to decide upon the limit above which it were useless to bring on premature labor, as also the time when, if done, it were best to accomplish it. The solution of this double question depends upon the gradual development of the fœtus after the seventh month of intra-uterine life. The dimensions of the fœtal head may be estimated approximately as follows: At seven months, the great transverse or biparietal diameter measures two and three quarter inches; at seven months and a half, three inches; at eight months, three and three-sixteenth inches; at eight months and a half, three and three-eighths inches; at nine months, three inches and nine-sixteenths. Beside this, a certain amount of diminution may be counted on, varying in different cases from three-sixteenths to six-sixteenths of an inch. Assuming one case as an example, it is proper, therefore, taking the above reduction into account, to bring on labor at eight months and a half when the pelvis has a diameter of but three inches and three-sixteenths of an inch, and to fix three and three-eighths inches as the limit above which it were useless to induce it.

Unfortunately, these dimensions have but a mean value, for they vary in every case with the size of the child, and the extent to which the head will yield, nor are there any clinical means of ascertaining the differences beforehand.

Many accoucheurs hold that, in a first pregnancy, premature labor ought not to be thought of when the pelvis has a diameter of more than three and three-eighths of an inch. Indeed, the fact that the woman is pregnant for the first time has been regarded as a formal contraindication of the operation. We shall state our own opinion the more freely on this subject, as we cannot understand why there should be any doubt about it. Premature artificial delivery is an innocent operation; how great, therefore, would be the regret if, after having waited until term, it became necessary to perform embryotomy upon a child which might have been saved by the former operation! In the interest, therefore, of the child itself, were it not better that it should encounter the inconvenience of a premature birth than the danger of a difficult delivery by the forceps? We would, therefore, in a case of first pregnancy, recommend premature delivery whenever we felt uncertain as to the result of labor at term, at the risk of being accused of having accomplished it unnecessarily; with much less hesitation, therefore, would we advise it when the pelvis is so contracted that labor at term would probably be very difficult or even impossible.

Previous labors afford fuller information as to what may be expected. If labor at term has been impossible or very difficult, premature delivery is indicated, however slight the contraction of the pelvis may be. But supposing the labors of a woman who has already borne children, have been easy, notwithstanding a contraction of three and three-sixteenths of an inch, ought anything to be done? Almost all accoucheurs reply that it would be better to wait, inasmuch as the probabilities are in favor of all the subsequent deliveries being accomplished in the same manner. I should feel less certain on this point, because there may result, as I have seen, a labor so difficult as to require the performance of embryotomy. Consequently, I would willingly advise the induction of premature labor in a case like the one supposed.

The longer the fœtus remains within the uterus, the more probable is it that it will survive. This proposition, acceded to by all, becomes a law to the accoucheur, requiring him to postpone premature labor as long as possible. It is plain that it ought not to be had recourse to, unless the interest of the mother or of the child should require it, and it would be immoral to operate recklessly, without a serious motive. Still, there should be no hesitation through mere timidity, inasmuch as there is no real ground for it. One does not grieve long over a spontaneous premature delivery, and we know that, by care, many of the children may be raised. Whether premature labor be spontaneous or artificially induced, the material conditions are the same; why, therefore, should there be any great hesitation in cases where it is proper to effect it artificially?]

Perhaps it would be proper here to give our opinion with regard to certain circumstances that have been stated by some accoucheurs as contraindications to the induction of labor; we allude to twin pregnancies and malpresentations. Could it be certainly ascertained that the patient was pregnant with twins, the time for performing the operation might be considerably postponed or everything even be left to nature if the pelvis were not very much contracted. The reason for this is, that twins are generally smaller than single children and their organization rarely complete enough to enable them to live when born before term.

With regard to a malpresentation of the fœtus, were we to pay any attention to it, we should often lose the advantages of the operation, since this is an obstacle of very frequent occurrence. And as a delay of a few days only may compromise the success of the attempt, it would be better to change the presentation by external manipulations, as performed by Stoltz. When this measure proves unsuccessful in modifying the presentation, we should still endeavor to excite the uterine contraction, so as to perform version as soon as the os uteri shall be sufficiently dilatable.

The mere detection of a vertex presentation is not a sufficient reason for feeling secure as respects an unfavorable position. In one of the six operations which I have had occasion to perform, although the contraction affected the antero-posterior diameter, the head presented in an occipito-pubic position after the membranes were ruptured: and as this circumstance required the application of the forceps and considerable traction, the child was born dead.

B. The cases in which there is a contraction of the pelvis do not constitute the only ones in which premature labor has been recommended. For the many serious diseases to which females are subject during the latter months of gestation are evidently connected with that condition; and depletion of the womb is the best and often the only means of removing them. This is also advised by some writers in certain affections that endanger the patient's life; among others, M. Ferniot has endeavored to prove, in a recent thesis, that under such circumstances the premature labor is quite as justifiable as in the pelvic contraction. Forced delivery was long since recommended in cases of profuse flooding, particularly in those dependent on the insertion of the placenta over the os uteri; and the artificial rupture of the membranes, resorted to in our day, is merely another method of bringing on the uterine contractions. Further, many skilful physicians have not hesitated to bring on labor when an attack of convulsions has resisted the ordinary remedies, or which, after being checked, returned every few days with a constantly increasing severity, (see pages 813 and 820.) And why should not the same course be pursued, when any serious disease, that existed before pregnancy, is so highly aggravated by this condition as to threaten an early termination in death, if its course be not speedily arrested by emptying the womb? In 1827, M. Costa submitted the question to the Académie de Médecine, whether or not it is proper to bring on labor whenever the pregnancy is complicated by any disease that seriously threatens the mother's life, supposing the fœtus is viable. We think the Académie erred in treating this proposition as *inexpedient;* for although Costa's question was too general, and, doubtless, ought to have been better matured before making a final decision, yet restricted within certain limits, determined by observation, it already has received and will still receive numerous applications in practice. For instance, an aggravated disease of the heart, general serous infiltration of the tissues, accompanied by effusions into the great cavities, a threatened suffocation, and the existence of a large aneurismal tumor, which is liable to be ruptured from the obstruction to the general circulation caused by the developed uterus, are certainly quite as dangerous as flooding or an attack of convulsions; and a premature delivery appears to me advisable, after all the therapeutical resources usually resorted to in such cases have been tried without benefit. It is important, however, that a determination of this kind should be come to very carefully, and, as often as possible, after consulting with enlightened practitioners.

In describing the disorders to which the pregnant condition exposes the female, it was stated, that whenever they became so serious as to threaten the life of the patient, we thought that the induction of premature labor was thereby sufficiently justified. Thus, vomiting which resists all therapeutic measures, extreme dropsy of the amnion, ascites connected with amniotic dropsy and threatening the patient with suffocation, and the recurrence of convulsions at short intervals and with increasing severity, are all of them, we have said, sufficient reasons for performing the operation.

But these are not the only cases in which the operation has been proposed, and we have yet some other indications to settle.

1. *Abdominal Tumors.*—In treating of the various tumors that so often complicate pregnancy and parturition, Dr. Ashwell suggests premature delivery as the most certain method of preventing those serious consequences, to which the patient is then exposed during the labor, or lying-in. But this opinion, in our estimation, is only admissible in the following cases:

1st. When any voluminous tumor whatever exists in the belly and incommodes the enlargement of the womb; or is itself exposed to such a compression as almost necessarily to lead to consecutive inflammation.

2d. When a tumor developed in the excavation is so fixed and adherent to the pelvic walls that it can neither be pushed above the superior strait nor drawn down beyond the vulva; provided its bulk is sufficient to prevent the expulsion of a fœtus at term.

2. *Smallness of the Abdominal Cavity.*—The capacity of the abdominal cavity in some individuals of very low stature, is so small as to be insufficient for the normal development of the uterus, which after attaining a certain bulk might render the regular performance of the great functions impossible. Thus, M. Depaul mentions a case of asphyxia occurring in a rachitic female who was affected with a deformity of this kind. Hence, it is evident that under similar circumstances, premature delivery might and ought to be thought of. Still, it is rarely necessary to have recourse to the operation, for the elasticity of the soft walls of the abdomen of these individuals permits the development of the uterus to take place outside, as it were, of the abdominal inclosure; and if the walls should prove too resisting, it is infinitely probable that in consequence of its violent compression, the uterus would enter spontaneously into action.

3. *Nervous Disorders.*—The nervous disorders which come on during gestation may sometimes become so serious as to suggest the question, whether it be not advisable to terminate the pregnancy which gave rise to them. M. Dubois was consulted in the case of a young lady in the third month of gestation, who had been affected for six weeks with symptoms resembling chorea. The spasms were first limited to the voluntary muscles, but finally invaded those of organic life, so that deglutition and speaking had become difficult. All the antispasmodics had been employed without success. M. Dubois replied, that he approved of the means that had been used, but that, whenever the convulsions invaded important organs, he anticipated the necessity of inducing premature labor.

We have in charge a young lady who, when in her ordinary health, has, very rarely, some short paroxysms of asthma, and then almost always in consequence of an emotion or physical pain, but which become much more frequent and distressing when pregnant. Having reached the fourth month of a fifth pregnancy, she has just had a slight attack of varicella, preceded by six days of intense fever. During these six days, the suffocative paroxysms became so serious, that MM. Andral and Dubois, who were called in consultation, delivered the most unfavorable prognosis. All these symptoms vanished upon the appearance of a dozen very small pustules, only two of which presented the umbilical depression. The idea of premature delivery might certainly present itself, should such accidents reappear and continue at a later period of the gestation; but it should not be forgotten that, as M. Laborie remarks, too much haste should not be made, inasmuch as these nervous phenomena often cease instantaneously; and the operation should be carried into effect only when the condition of the patient demands it imperiously.

4. *Intercurrent Acute Diseases.*—Most of the acute affections which occur during pregnancy, seem to be affected unfavorably by abortion and spontaneous delivery. We have already stated that in cholera, in which the induction of premature labor and abortion have been recommended as a therapeutic measure, there was nothing to prove conclusively that the expulsion of the fœtus was attended with any favorable result. We think therefore that, as yet, it were wisest to abstain.

5. *Death of the Fœtus in preceding Pregnancies.*—There are certain women who, after reaching the eighth or ninth month of gestation without the slightest disorder, suddenly find the active motions of the fœtus to diminish, and the child dies. This unfortunate event occurs with some again and again, for several consecutive pregnancies, so that certain females have been known to be delivered thus prematurely, and always of a dead child, five and six times in succession. Denman, and several others, thought that by bringing on labor before the period at which the fœtus had perished in the preceding pregnancies, there would be a chance of obtaining living children. In two cases mentioned by the English author, the operation proved successful. The indication should not, therefore, be entirely rejected. However, it is well to observe with M. P. Dubois, that, notwithstanding the fatal termination in preceding pregnancies, there is always cause to hope for a happier issue as respects the one in charge, so that it is impossible to establish a general rule in reference to the matter. It is one of the cases in which the responsibility of the physician is deeply implicated. (See page 558.)

6. Finally, the induction of premature labor has also been recommended in cases in which the fœtus is dead, and in pregnancies which overrun the usual time. At present, and especially in France, the supposed disorders attributed by Mai and Fodéré to the death of the fœtus in the womb, are no longer believed in. Expectation is adopted, because it is well known that the mother incurs no danger, and that nature will rid herself of the dead fœtus without requiring the intervention of art. Nor are the dangers of the delayed pregnancies less illusory.

ARTICLE II.

OPERATIONS FOR THE INDUCTION OF PREMATURE LABOR.

The methods proposed for effecting the premature expulsion of the child are quite numerous; they are all based upon the contractile power of the womb, which they are intended to call into activity until the ovum is expelled. We shall divide them into three classes, to the first of which belong all those which, by primarily influencing the general organization, have the secondary effect of exciting the uterine contractions; to the second, those depending upon the excitement of some organ, the breast for example, which by reflex action stimulate the uterus to contraction; and to the third, all those that operate directly and mechanically upon the womb, for the purpose of arousing its action.

The operation of the means appertaining to the first division is too uncertain to be relied upon in a case where it is necessary to act promptly and surely; and although tepid bathing, venesection, &c., have occasionally been followed by a premature delivery, yet no one would ever think of employing them with this view. Even the partisans of ergot are few in number; for though its influence in rendering the slow and feeble contractions of the organ more energetic is undoubted, there is no positive evidence that it is capable of arousing them when none have previously existed.

[The second class includes the means of stimulating the womb by reflex action. To effect it, the close sympathy known to exist between it and the breasts is made use of, the stimulus applied to the one being reflected upon the other. The observation of this fact led Frerichs to suggest the application of sinapisms and flying blisters upon the breasts in order to excite uterine contraction. Scanzoni afterward took up the idea and recommended the application of gum-elastic cups to the breasts, reporting at the same time several instances of success, though he also witnessed some cases of fainting produced by them. Chiari, Kilian, and Stohl have not met with much success by this method, so that, upon the whole, it must be reckoned as too uncertain to be relied on.

Therefore the agents of the third class only, which act directly upon the ovum or the womb, are capable of bringing on with certainty, the contractions of the latter. We shall divide them into five categories, determined by the part to which they are applied, viz: A. External stimulation of the body of the uterus; B. Stimulus applied to the circumference of the os tincæ; C. Dilatation of the neck of the womb; D. Stimulants inserted between the walls of the uterus and the ovum; E. Rupture of the membranes.]

A. External Stimulation of the Body of the Uterus.

Dry Frictions over the Abdomen.—The repeated frictions over the anterior part of the belly, and the fundus of the womb, originally recommended by Professor D'Outrepont, to which Ritgen added direct excitation of the os uteri by one or more fingers introduced into the vagina, are now generally rejected. In truth, the irritation thereby produced is too feeble and transitory to bring on a genuine labor.

[*Electricity.*—Electricity was proposed and tried by both Kilian and Schreiber without much effect. One pole of a galvanic battery was put in connection with the fundus of the womb and the other with its vaginal portion. An electro-magnetic apparatus may also be made use of; that of the Lebreton brothers was tried by M. P. Dubois, though without success. Great hopes, indeed, had been based upon electricity as an agent for producing the effect in question, but experience soon showed that they would have to be relinquished.

B. STIMULUS APPLIED TO THE CIRCUMFERENCE OF THE OS TINCÆ.

The means of accomplishing this, comprise the various modes of applying the tampon, and douches either of water or of carbonic acid gas.

Hüter's Process. — Hüter inserted into the vagina, so as to be in contact with the neck of the womb, a bladder filled either with water or decoction of ergot, hoping that the latter medicament might transude by exosmosis and assist the mechanical action of the bladder. Prof. Bush substituted a dog's bladder for that of a calf, and advised it to be withdrawn every six hours, in order to wash out the vagina by means of injections. This process is deficient in irritating power, so that in most of the cases in which it was used, it was necessary to have recourse to more energetic measures.]

Schœller's Method. — Quite recently, Dr. Schœller, of Berlin, has suggested a measure which is new as to its proposed object, though one of long standing in obstetrical science. Every practitioner is aware of the principal objection to the use of the tampon, so highly extolled by Leroux, of Dijon, as a remedy for uterine hemorrhage; now M. Schœller has conceived the idea of employing the irritation it produces as a means for the induction of premature delivery; for it is well known that its application is most generally followed by uterine contractions. He first made use of it in 1839, and was entirely successful; since that time he has performed five similar operations, and the child was born living in four of them. The mode of operating, according to Stoltz's translation, is as follows (*Gaz. Méd. de Strasbourg,* Jan., 1843):

Before commencing, the bladder and rectum are to be emptied; then several little rolls of charpie, steeped in oil, or smeared with cerate, are successively pushed towards the upper part of the vagina, the first of them having a piece of tape attached, to facilitate its subsequent extraction. Prepared sponge might be used for the same purpose, but it would then be requisite to retain it *in situ* by another common sponge. It is not necessary to fill the whole vagina; in fact, this would be attended with some inconvenience, for the excretion of the urine and fecal matters would be thereby impeded. It is advisable to introduce the tampon in the evening, when the patient is recumbent, because she will be more likely to remain quiet during the early periods of its operation.

The effects of this measure are shortly manifested by pains in the abdomen and loins, and by a feeling of tension in the womb itself; repeated frictions are then made over the fundus uteri, with a view of aiding its operation. As the tampon soon becomes saturated with the mucus from the vagina, and exhales a disagreeable odor, it ought to be renewed at least once in the course of the day, or even twice, if the sensibility of the parts permits; but, before introducing the second one, the vagina is washed out by an injection. As soon as the tampon has roused the uterine contractility, and the orifice dilates, it may be withdrawn; though, should the labor be lingering, and the contractions become slow and feeble, it must be reapplied, and ten grains of the secale cornutum be administered by the mouth every half hour. The pains may also be restored by dilating the orifice with the index finger, carefully avoiding a rupture of the membranes, until the dilatation is nearly completed.

[Schœller's tampon, unfortunately, is both uncertain and painful in its application. Hoffman's statistics show that out of 20 cases it succeeded in 12 only, when used alone. Once it was necessary to dilate the cervix besides, and in 7 cases it had no effect whatever.

Braun's Process.—Braun (of Vienna) proposes substituting Schœller's charpie tampon, and Hüter's bladder of animal membrane, by a reservoir of vulcanized gum-elastic from two to four inches in diameter, and provided with a stopcock. His instrument has received the name of *Colpeurynter*, and is used very easily, being managed like Gariel's air pessary. It is first emptied and inserted into the vagina, and afterward dilated by the injection of warm water. The gum-elastic bulb does not deteriorate like the bladders of animals; besides which, Braun claims for it the advantage of distending the upper part of the vagina only, without compressing the lower portion.

Professor Stoltz says that the colpeurynter has been used only five times in cases of contracted pelvis, and twelve times in cases of disease during pregnancy. It proved ineffectual in the first set of cases, but succeeded better in the second, probably because there was already present a tendency to labor.]

Uterine Douches.—Lastly, there is a still more recent process, possessing undoubted advantages over all the others, namely, that which consists in directing a stream of warm water upon the neck of the uterus. The honor of introducing it into obstetrical practice is due to Professor Kiwisch. His apparatus was a simple tin box, provided with a long tube furnished with a stopcock. The extremity of the tube is introduced by the vagina to the neck of the uterus. The temperature of the water should be about 76° or 78° of Fahrenheit, and the jet should be large and powerful. The injections should last from 10 to 15 minutes without interruption.

Instead of Kiwisch's apparatus, M. P. Dubois uses Dr. Eguisier's instrument for irrigation and steady injection. The latter containing six quarts of fluid, is sufficient for a douche of a quarter of an hour in duration, and there is no occasion to renew the water as in Kiwisch's contrivance. Besides, there is no necessity for its being very elevated like the other, which renders it much more convenient to manipulate. I made use of Eguisier's pump in the three cases in which I employed the uterine douches. Unfortunately, it is quite expensive, and not readily procured out of the city. Therefore, it is well to remember that any vessel capable of containing eight or ten quarts of water, placed at an elevation of seven or eight feet, and provided with a flexible tube of sufficient length, will serve the same purpose. The tube is furnished with a stopcock about a foot from its free extremity. To this extremity is adapted a gum-elastic canula with a single orifice the sixteenth of an inch in diameter. The power of the jet may be increased or diminished at will by varying the calibre of the canula.

The woman's seat is brought to the edge of the bed, which is previously covered with oil-cloth, so that the water may fall into the vessel placed between the legs without wetting the clothes or the bed. The forefinger of the left hand is introduced to the cervix for the purpose of guiding the canula which the accoucheur holds in the right hand.

In ordinary cases three or four injections a day are sufficient, though, if the case were urgent, they should be repeated more frequently.

The number of douches required varies greatly. Sometimes the contractions appear upon the third or fourth application; in one of my own cases, the first pains were perceived after the second douche, though generally a much greater number are required. In the ten observations of Kiwisch, he was obliged to repeat them four times at the least, and eighteen times at the most; the mean for the ten cases being ten douches.

The mean length of time between the commencement of the operation and the moment of delivery, was about three days and a half. In one case, but twenty-four hours elapsed, whilst in two others it was delayed seven days.

[To increase the efficiency of the uterine douches, it is only necessary to direct the extremity of the canula upon the os tincæ, so that the water may be projected directly into the neck of the uterus. M. Blot on several occasions even inserted the canula into the neck, so that the jet reached and detached the membranes. This is a modification of Kiwisch's method, well calculated to bring on labor within a very short time.

There can be no doubt as to the efficiency of the douches, and they are, consequently, very much used. The apparatus is made very readily, and women submit willingly to an operation of so simple a character as to be readily understood by them, and which gives them no pain.

Of eighty-one cases quoted by Stoltz, in which the douche was used in order to bring on labor, it, alone, was successful in sixty-eight; but in thirteen cases it was necessary to use more active measures in addition. The method, therefore, sometimes fails, which is not, however, the most serious objection that can be made to it. Though I have often had occasion to use it both at the Maternity Hospital at Paris and at the hospital of the Clinic, I do not share the enthusiasm to which it has given rise. It is almost always slow in its action, and so exhausts the patience of both the woman and the operator, besides compromising the successful issue in some cases by the delay which it occasions. But this is not the worst, for notwithstanding all that has been said of its innocency, the douche is dangerous, and may prove rapidly fatal. In a paper read at the Academy of Medicine I related the case of a woman, the posterior cul-de-sac of whose vagina was lacerated by it; an event which experiments upon the dead body assure me is of very possible occurrence when a powerful apparatus is used. I also reported several cases of sudden death whilst the douche was being administered under the charge of such men as MM. Depaul, Salmon (of Chartres), and Simpson, whose skill is beyond questioning. Prof. Depaul, in relating his own case to the Surgical Society, thought he could account for the event by the introduction of a few bubbles of air into the uterine sinuses, and I think his explanation a good one, for in every instance the symptoms observed were those produced by the entrance of air into veins. It will readily be admitted that such accidents as these ought to make accoucheurs more careful in the use of uterine douches than they have been.

Douches of Carbonic Acid Gas.—Scanzoni (of Würtzburg) recommends the use of a jet of carbonic acid gas, directed upon the neck of the womb by an appropriate apparatus. Though employed by its author, the method is not likely to come into common use.]

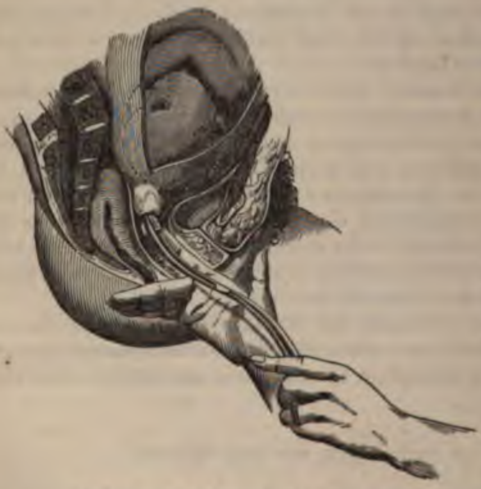
C. DILATATION OF THE NECK OF THE WOMB.

Dilatation by Prepared Sponge.—Some accoucheurs have endeavored to bring on contraction of the womb by keeping a foreign body within its neck, which shall act both as an irritant and a mechanical dilator. Kluge may be regarded as the inventor of the process by dilatation, and his method is the one still generally preferred. It consists, as is well known, in the insertion of a cone of prepared sponge in the cervix, and keeping it there by means of a tampon, until the pains are fully developed. The mode of operating is as follows:

After having obtained the patient's consent, and, whenever possible, the advice of some professional brethren, the accoucheur has the woman prepared, by directing her to use warm emollient and narcotic injections into the vagina, for a few days previous to the operation; before commencing, the bladder and rectum are to be emptied, and a fresh examination is to be made for the purpose of ascertaining the degree of the pelvic contraction, as well as the child's position.

The female being placed in nearly the same position as if the forceps were to be applied, the operator first draws the cervix towards the median line, whenever it is found deviated; or he might endeavor to get the neck within the uterine extremity of a speculum (Dubois). But this is not always practicable, especially if the part be directed a little forward; in general, the finger answers every purpose as a conductor; then a conical plug of prepared sponge, about two inches long, and half an inch in diameter at its base, and having a piece of tape ten inches long attached to it, is held by its large extremity, in a pair of long curved forceps, and is carried up towards the uterine orifice where it is gradually made to enter. After holding it there for five or six minutes, the forceps and speculum (if used) are withdrawn, and the vagina is next filled up with a large sponge, or bits of charpie, so as to keep the first sponge in its place; the whole is to be retained by a proper bandage, and the patient replaced in bed. The mode in which the foreign body acts here is obvious; the prepared sponge becoming saturated with the fluids from the neighboring parts, swells up, and irritates the cervix by its bulk; this determines a dilatation of the latter, and the irritation thus caused, by reacting on the fibres of the uterus, often brings on the contractions in five or six hours. Should it happen that the pains are not fully established, or the dilatation of the os uteri is not completed in the course of twenty-four hours, the operation ought to be performed again, taking care this time to introduce a larger piece of sponge (the first having been extracted by the tape); this second operation is nearly always successful. If, however, the labor-pains be still too slow and feeble,

FIG. 145.



Kluge's method of dilating the os uteri.

local irritants, such as frictions over the abdomen, and titillations of the cervix, or, still better, the general stimulants, ergot particularly, might be resorted to.

The necessity of plugging the vagina, and keeping the tampon applied for two or three days, and sometimes even longer, occasions great suffering to the woman. From having witnessed this suffering, I had an instrument constructed, in 1845, by means of which the prepared sponge is kept in its place within the cervix. It is composed: 1. Of a hypogastric belt, to the middle and front part of which is secured a metallic stem eight inches long, and curved at its free extremity, which carries a canula one and a half inches in length; 2. Of a stem of whalebone, six or seven inches long, and about a quarter of an inch in diameter, bearing at its extremity a forceps with claws capable of being closed at will, by means of a sliding ring, like those of a porte-crayon. The prepared sponge is first fixed in the forceps, and then introduced as usual within the cervix: the whalebone stem is next introduced into the canula and held fast by the pressure of a screw.

In this way, the use of the tampon, which is always painful, is avoided; the sponge cannot be displaced and escape from the cervix, as often happens in Kluge's process, nor are the functions of the bladder and rectum in any degree interfered with. The patient is not condemned to the absolute repose usually directed, but can move in bed without inconvenience. I therefore regard it as a plan which does away with most of the inconveniences justly complained of in the performance of the operation.

[A great recommendation of the prepared sponge is, that it acts very gently and is devoid of danger either to mother or child; on this account it was preferred by all accoucheurs before Kiwisch's method was known. Unfortunately, the operation, apparently so simple, is really quite difficult; for the cervix is often so high up that it is found to be no easy matter to fix it with the fingers and insert the sponge. Kluge himself, in one case, after several fruitless attempts, was obliged to relinquish his own process.

Another inconvenience of the sponge is, that it sometimes acts very slowly, and occasionally is not sufficiently irritating to excite the uterus to contraction.

Prof. Hoffman gives an analysis of 70 cases, furnishing the following results: 56 times the sponge alone was sufficient to bring on labor, and it was rarely necessary to use it twice; 7 times it was used in connection with other processes; 7 times it failed, but still dilated the neck sufficiently to allow the membranes to be ruptured. The duration of the labors was noted, in the same number of cases, as follows: 24 hours in 9 cases; 48 hours in 14 cases; 3 days in 10 cases; from 3 to 8 days in 12 cases; from 9 to 13 days in 3 cases.

The event in every instance was favorable, both as regards mother and child.

The use of prepared sponge, therefore, compares favorably with uterine douches, and has, besides, the immense advantage of not exposing the patient to sudden death.

Busch's Dilator.—Busch devised a three-branched dilator which, when closed, is of about the size of a pair of dressing-forceps, and whose slender extremity passes easily into the uterine orifice. When used, it is inserted into the neck to the distance of five-eighths of an inch only, and then opened further and further at intervals, until it shall have excited contraction of the womb or occasioned considerable local pain. Busch's instrument has far less merit than the sponge; its action is intermittent, and its valves, as they spread, act only on the points with which they are directly in contact, necessarily giving rise to painful stretching.

The results obtained by this instrument are neither numerous nor encouraging. Hayn, it is true, professes to have excited the pains of labor in eleven hours; but Busch himself never accomplished the same object in less time than three days, and in two cases not until after eight days of strong and painful effort. There are, therefore, serious objections to the process, and it ought never to be used unless for the purpose of facilitating the introduction of a cone of prepared sponge.

Krause's and Meade's dilators are very similar to Busch's instrument, and are liable to the same objections.

The Spheno-Siphon.—The dilator invented by Schnackenberg is entirely different from the preceding. It is called the spheno-siphon, and is composed of a syringe, to which is adapted a tube two inches in length, and provided with two lateral fenestra. The latter is covered with a distensible bag of prepared skin, which, when most widely dilated, has a diameter of from an inch and three-quarters to two inches. The operator passes the canula gently into the cavity of the neck, and when *in situ* depresses the piston, which is held by a screw. This ends the operation for the first day, and the instrument is attached to a body bandage. The next day the piston is pressed down still further, forcing more fluid into and dilating the bag. The same process is repeated on the third day.

The spheno-siphon, like the prepared sponge for which it is a substitute, is intended to dilate the cervix mechanically and excite the uterus to contraction. It is a complicated instrument, necessarily inconvenient to the patient and seems thus far not to have been put much into service. It is figured in Busch's Atlas.

Barnes' Dilator.—Dr. Barnes introduced, in the year 1862, a new dilator, composed of a gum-elastic bag, in shape resembling a violin, and ending in a long tube. The instrument is of three sizes, the smallest being from three-quarters of an inch to an inch and a quarter in width. The inventor begins by exciting contractions through the use of the uterine douche, Braun's colpeurynter, or the prepared sponge, and when the neck is sufficiently dilated, inserts his bag by means of a probe whose end passes into a little pouch made for the purpose. The central part of the dilator is intended to be co-extensive with the entire length of the cervix, its upper extremity extending beyond the internal orifice, whilst the lower one projects into the vagina. The peculiar shape of the instrument is intended to guard against its slipping; for when distended, its middle portion is cylindric, whilst the ends spread out like a mushroom. When *in situ*, water is forced into it by means of a syringe, and its distention dilates the neck considerably. A larger instrument is then substituted, and the process continued until the dilatation is sufficient to allow version to be performed.

Dr. Barnes' method is complicated, and his instrument comes into play only when labor has begun through the use of other means. Therefore, as his object is merely to hasten it, he entitled his paper, "*A New Method of Accomplishing Premature Delivery at a Specified Time.*" But let us hear the author himself: "All the known methods of exciting premature labor are very uncertain as respects the time required for producing the desired result. The slowness of the process is liable to serious objections, for whilst the accoucheur is kept waiting for hours and days for the labor to be completed, the woman herself is worried by the delay and tormented by fear. Thus her moral and physical forces are severely tried, and, after all, when the delivery is about to take place, the doctor may be away. Thus mother and child are exposed to needless risk.

"Nor is the doctor's position an enviable one: when he began the operation for inducing labor, he involved himself in professional responsibility and personal solicitude. He is obliged to be at the disposal of the patient until she is delivered, and can, therefore, assume no other engagements. This impossibility of being at liberty, and that for an uncertain period, is a serious inconvenience, not only to himself, but to his other patients. Now the patient, as well as the physician, may be relieved of all these uncertainties and inconveniences by the operation which I propose, and which has proved successful on various occasions. Labor may be brought on at will, and terminated at any hour he chooses, with as much certainty as any other surgical operation. By adopting the new method, he may attend to engagements at any distance from home, and then finish the case at once, just as he would cut for the stone. The operation is under the entire control of the performer, who is no longer the slave of circumstances, and not obliged to await anxiously the efforts of nature. In short, he is master of the position, and determines beforehand what, under the requirements of the case, shall be the period at which the patient shall find herself free from the dangers of childbirth, and can confidently inform her when her anxiety shall be over." (Barnes.)

In more than one respect we are obliged to differ from Dr. Barnes, though his instrument seems calculated to be of real service. We used it successfully in a case of induced abortion in which the labor was too tedious. It certainly, in this instance, very much hastened the moment of delivery.

D. Irritants placed between the Walls of the Uterus and the Ovum.

Detachment of the Membranes.—This operation is accredited to Hamilton, who, in the year 1800, proposed passing the finger forcibly through the neck and internal orifice of the womb, and detaching the membranes as far as practicable. He had observed that when the ovum becomes separated for a considerable extent from the wall of the uterus, its expulsion necessarily ensues very soon. His process, however, was so rough, violent, and often impossible, especially in first pregnancies, that it was soon abandoned.

Mampe, and subsequently Pfenninger, Billeter, and Campbell, thinking that an instrument capable of being inserted more easily than the finger, might be substituted for it, proposed the use of a gum-elastic bougie, with its extremity rounded in order to avoid rupturing the membranes. The operation would seem to be of easy performance and free from danger to either mother or child.

Other accoucheurs have made use of sounds of horn or metal, for the purpose of detaching the membranes.

In 1848, Professor Lehmann (of Amsterdam) recommended that a bougie of medium size be passed into the uterus to the distance of eight or ten inches, and immediately withdrawn; the operation to be repeated until labor is fairly begun. His idea is, that the double object of detaching the membranes and stimulating the uterus to contraction is thus obtained. In 1852 he published eight successful cases, in one of which the bougie was twice inserted, and three times in another. The duration of the labor was from one to five days, and the delivery accomplished favorably to both mothers and children. This plan was favorably received in England, and is still frequently used there. Its simplicity and easy execution give it a claim to consideration, though it is far from being as certainly and promptly effectual as in the cases reported by Lehmann.]

Cohen's Method.—Ought we to attribute any greater value to the uterine injection, recently proposed by Dr. Cohen, of Hamburg, for the artificial induction of premature labor? Experience can alone determine the question. His process is, however, so simple, and, according to the author, is attended with such prompt effects, and is so devoid of danger, that we think it right to notice it. He says, "I perform the injection as follows: I use a small syringe, usually of pewter, containing from two to two and a half ounces of tar-water, and whose canula, from eight to nine inches in length, and about the eighth of an inch in diameter, has a curvature similar to that of a female catheter. I lay the woman flat on her back with the hip raised, then, inserting two fingers up to the posterior lip of the os tincæ, I use them as a guide to the canula, which I pass between the anterior wall of the uterus and the ovum to the distance of two inches within the uterus. It is then only that I commence the injection. I force it gently and slowly, taking care to raise the syringe a little to avoid applying the opening against the wall of the uterus, and changing the direction of the instrument whenever any obstacle presents to the passage of the fluid. The syringe is withdrawn very gradually; ten minutes afterward, the woman may rise and walk, and if at the expiration of six hours there is no appearance of labor, the injection is renewed." . . . . . As M. Cohen has succeeded once, and the process is so harmless, it is very desirable that he should try again.

[*Krause's Operation.*—This Professor recommends that a flexible bougie be passed into the uterus to the distance of from eight to ten inches, and left there until the desired effect is obtained. It was done successfully at Gröningen, and it is desirable that its merits be proved and compared with those of the intra-uterine dilator.

Intra-uterine Dilator.—Lastly, I have myself proposed the use of a new instrument, which I call the *intra-uterine dilator*. The principle of its construction is as follows: the insertion through the cervix to some distance above the internal orifice of a gum-elastic tube of the size of a goose-quill, which is so constructed that its end swells out into a bulb of the size of an English walnut, when an injection is forced into it. The apparatus is to be left *in situ* until expelled by the uterine contractions.

The first case in which it was employed was published in the *Gazette des Hopitaux*, January 9, 1862. I then used a metallic tube of medium size, terminated by one of gum-elastic about an inch and a half long. A stopcock, placed near the trumpet-shaped end of the instrument, and a syringe, completed the apparatus, which is represented in M. Charrière's catalogue, published on the occasion of the London Exhibition.

The operation of the instrument is readily understood. The dilator is passed into the neck of the womb until its dilatable portion, that is to say, the part covered with gum-elastic, has got beyond the internal orifice into the cavity of the organ. Then warm water is forced into the tube, the gum swells out into a ball, the stopcock is closed, and the apparatus keeps its place without a bandage, being prevented from slipping out by the dilated extremity of the instrument.

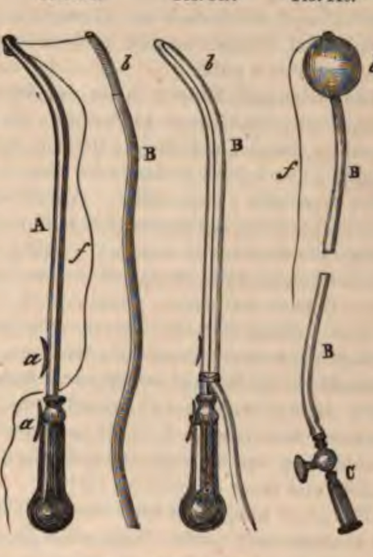
The direction assumed by this dilator, when *in situ*, is nearly that of the uterus, the metallic stem emerging from the vagina at the posterior commissure of the vulva, and projecting behind the thighs. This sort of caudal appendage was so inconvenient that the women could neither lie on the back nor be seated without the risk of suddenly displacing the instrument. This great defect was remedied by cutting off the metallic tube about two inches below the gum. To the end of this segment is adapted, on the one hand, a movable handle, which can be withdrawn when the instrument is applied, and, on the other, a flexible tube which traverses the vagina and is fitted externally with a stopcock to which the injecting syringe is adjusted. With this alteration, the women may assume any position, lie down or walk about, without inconvenience or danger. This last instrument is the one which I exhibited before the Academy of Medicine in November, 1862, and is figured in the report of the *Gazette des Hopitaux* of the same month.

I now use an instrument which is more complete and simple, although at first sight it would seem to be quite complicated. It is composed of two fundamental parts: a gum-elastic tube and a conductor.

1. A gum-elastic tube, of the size of a goose-quill, about a foot long and closed

at one end (Fig. 146, B). This tube is thick and resisting in the greater part of its length (Fig. 146, B), but its walls grow thinner toward its end for the space of from an inch and a quarter to an inch and a half. (Fig. 146, *b*). When an injection is forced into it, the unequal thickness of the walls causes the thin part to become dilated. (Fig. 148.)

Fig. 146. Fig. 147. Fig. 148.



Intra-uterine dilator.

To the end of the tube (Fig. 146), a cord about eighteen inches long is attached, strong and small; the best for the purpose that I know of being what the women call "soutache," of white silk. This thread being very liable to slip, in order to prevent it, I drop into the end of the tube two shot soldered together, and am careful to tie the thread exactly in the groove between them. When this is done, the thread always holds. The other end of the tube is fitted with a socket provided with a stopcock (Fig. 148, C), for the reception of the injecting syringe.

2. A metallic conductor with a blunt extremity grooved through its entire length, and curved like a hysterometer. (Fig. 146, A.) A tolerable idea may be formed of it by imagining a male catheter cut in half, lengthwise, and the convex portion removed. This conductor is pierced with three holes for the passage of the thread. The two first are near its end, and about three-eighths of an inch apart. The third is near the handle to which the conductor is attached.

To adapt the tube to its conductor, the free end of the thread is passed through the eye nearest the end of the conductor, from the grooved toward the convex side. It reënters the groove through the eye next below (Fig. 146), and then passes along it through its entire length, coming out again through the eye near the handle. When the string is drawn tight, the upper end of the tube fits into the end of the conductor, and is held there by fixing the string by means of a string provided for that purpose. (Fig. 146, *a*.) The body of the tube is next placed in the groove, and made fast by a few turns of the remaining portion of the string. Lastly, the end of the string is secured by passing it beneath the spring already mentioned. (Fig. 147.) The entire apparatus, when mounted, is not longer than a common catheter. (Fig. 147.)

The instrument is used as follows: When the tube has been provided with its string, an experimental injection is made into it, in order to ascertain whether a crack or other opening exists in it. This having been accomplished, the tube is held vertically, with the stopcock uppermost and open. A few bubbles of air are first discharged, followed by water, which is allowed to flow away. When the tube has resumed its usual size, it collapses; that is to say, the air has been expelled, and the stopcock is closed, to prevent any more from entering. This precaution is taken, lest any air should be forced into the uterus, in case the gum-elastic bulb should happen to burst.

The tube thus prepared is next adjusted to the conductor in the way above described. To lubricate it, glycerine should be used, because fatty matters alter the gum very quickly, and cause the apparatus to rupture.

The woman being placed across the bed, with the hips raised and projecting over the edge of the mattress, the legs being held apart by two assistants, the operator passes two fingers of the left hand into the vagina, and places the end of the forefinger upon the os tincæ. The dilator, held in the right hand, is passed into the vagina; its extremity is guided into the cervix, and by depressing the handle, it usually passes without difficulty into the uterus, going between the ovum and the anterior wall of the womb. It ought to go an inch and a quarter at least beyond the internal orifice; a small projection upon the conductor, four inches from its end, serves as a guide.

The instrument is held in position whilst the turns of the string which hold the tube to the conductor are unwound. An assistant fills a syringe with warm water, expelling the air, and inserts its tube into the socket which hangs outside of the vagina. The injection should be made very slowly, though it requires considerable force, especially at the outset. A little more than an ounce and a half of liquid is sufficient to swell the gum-elastic bulb to the proper size. When the injection is completed, the stopcock is closed, the string is detached from the spring which holds it, and the conductor is easily withdrawn by gentle traction. The tube being held by the bulb at its extremity, remains with the string hanging beside it.

It only remains to take measures for preventing the stopcock from opening, and to attach it to a simple or body bandage. I prefer, however, merely to tie the tube securely at the vaginal orifice, and remove the stopcock altogether. The women being then free from any impediment to motion, are free to move about their chamber and engage in their usual occupations. It is even preferable that they should keep up, for then the gum-elastic bulb presses directly upon the internal orifice, and labor commences earlier.

The pains sometimes come on whilst the instrument is being applied, though, on an average, they do not begin until three or four hours after operating. At first, they are feeble, but become gradually stronger and nearer together, as in natural labor. The cervix becomes effaced and opens out, until at last the instrument falls into the vagina. This expulsion generally takes place in ten or twelve hours, though sometimes much sooner or rather later. Statistics of all the operations I expect to give hereafter.

By the time the dilator is expelled, the neck of the uterus has become effaced, is widely open, and the membranes are projecting through it. In the majority of cases, the labor continues, but sometimes it ceases. I have often remarked that it was only necessary to make the women walk about, and to leave the instrument in the vagina, where it doubtless acts, like Braun's colpeurynter, to make certain the continuance of the contractions. When, notwithstanding all these precautions, the labor stops, it becomes necessary to introduce the dilator again, giving it, this time, a larger size.

Once only, in a case of M. Depaul's, was this plan ineffectual; whenever the instrument was expelled from the uterus into the vagina, the labor ceased. M. Depaul was obliged to rupture the membranes, and even then his patient was not delivered until a long while after. I am satisfied that in this case success would have quickly followed the use of Barnes' instrument immediately after the dilator was expelled. I even think that it would oftentimes be very useful to associate these two instruments, on account of the impulse which they would give to the progress of the labor, and that their conjoined use is destined to be a real step in advance in the induction of premature delivery.

I attribute the efficiency of the dilator to a special property of the uterus, in virtue of which it tends to contract, in order to expel a foreign body within it. It also acts by detaching the membranes, though here less decisively, since it seems to be shown by some of my cases that the labor stops when the instrument is withdrawn too soon, although detachment of the membranes had resulted from its application.

Having by this time had quite a large experience, I am justified by the facts in saying that there is no difficulty in the operation, as will be attested by Drs. Danyau, Depaul, Pajot, and Blot, all of whom have frequently performed it successfully. It is, besides, entirely innocent as regards both mother and child, and is far more certain and rapid than any other process. A no less great advantage is its extreme simplicity as compared with the difficulties met with in the use of the prepared sponge and uterine douches. It is also completed at one time, and in exceptional cases only has it to be repeated; when the instrument is once applied, there is nothing to be done but to await the delivery.

It would have been thought, *à priori*, that this process would be liable to rupture the membranes, but it will suffice to say that in twenty cases it did not happen. A more valid objection is the possible rupture of the gum-elastic bulb. This occurred four times in the first ten recorded cases; but since then, having used an improved dilator, I have known it to occur but once. The result was an involuntary injection into the uterus, as in Cohen's process, giving rise neither to pain nor accident of any sort; the operation being merely interrupted for the time required to adjust to the conductor another tube, which it is always well to have on hand in case of accident.

The only serious fault to be found with the intra-uterine dilator is, that in some rare cases it would be impossible to introduce it into the uterus. Should the head be very low down, or the neck much deviated, insurmountable difficulties might be met with. Whilst acknowledging the objection, I would only observe that it applies equally to the various processes of detachment of the membranes, Cohen's intra-uterine injections, and to all the methods of puncturing the membranes.]

E. PUNCTURE OF THE MEMBRANES.

Usual Method.—Puncture of the membranes is certainly the surest of all the processes and the one most likely to be the first to suggest itself. It was performed by Macaulay when, for the first time, he acted on the advice given in 1756 by the most celebrated physicians in London. Most accoucheurs who have performed this operation since his day have likewise punctured the ovum; the various modifications suggested at different times merely refer to the shape, the length, or the curve of the instrument used, and scarcely merit a notice. For it must be evident that any canula whatever that is sufficiently curved to correspond with the line of the pelvic axis, and is long enough to reach the os uteri without difficulty (that is, about eight to eight and a half inches), and furnished with a trocar, having its point concealed within, or only projecting a few lines beyond the end of the canula, will be all that is requisite. The only precautions to be observed consist in guiding the instrument along in such a way as not to injure the mother's parts, and so as not to wound the fœtus by the point of the trocar.

As elsewhere stated, this is the most certain plan, because a discharge of the waters necessarily occasions a retraction of the uterine walls, and sooner or later a manifestation of the pains; we may further add, that it is quite as easily accomplished, and is less painful to the mother than those about to be described; but we must acknowledge that the child's existence is much more endangered, because a partial or even a total escape of the amniotic liquid is not always followed at once by the occurrence of the first pains.

Sometimes forty or even sixty hours elapse before the uterus, irritated by the prolonged contact of the fœtal inequalities, begins to contract; and even when the labor has actually commenced, the dilatation of the os uteri progresses very slowly, for at the seventh or eighth month the fibres in the neck have not as yet undergone those modifications which, at the ordinary term of gestation, render the dilatation easy; and thus a further period of twenty-four or thirty-six hours often passes away before the os uteri is sufficiently dilated. Now, during all this time, the fœtus, being no longer protected by the amniotic liquid, is subjected to the direct pressure of the contracted uterine walls; the umbilical cord might very easily be involved, and from its compression, an interruption of the circulatory relations, which are indispensable to the support of the child's life, would inevitably result; besides which, the placenta itself might be partially detached in consequence of the retraction of the womb.

Many accoucheurs, influenced by these palpable dangers, had altogether rejected the perforation of the membranes, when a modification was proposed by Meissner, of Leipsic, which fortunately prevents the accidents just indicated, and therefore merits a further investigation into the propriety of puncturing the ovum. Various plans were suggested for moderating, as it were, the discharge of the amniotic liquid, and of only permitting the escape of a sufficient quantity of it to secure the induction of the pains; but no one had hitherto succeeded in accomplishing what Meissner has so happily effected. His process is as follows:

Meissner's process.—Instead of puncturing the bag of waters at its lowest part, he perforates it high up close to the fundus of the womb, by using an instrument consisting of a canula and two stylets. The canula, which is made of silver, is nearly thirteen inches long, and about two lines in diameter; and it is curved so as to correspond to a segment of a circle which has a radius of eight inches. A ring is attached to it, near the lower extremity on the convex side, by which the instrument is managed, and which serves to indicate the direction of the curvature after the introduction. The two stylets (one being terminated above by an olive-shaped button, and the other by a trocar) are adapted to the canula; their lower end is flattened out so as to keep them from slipping in too far; the olive-shaped extremity of the first stylet ought not to project more than two or three lines beyond the canula; but the trocar point of the second should advance at least half an inch. The first stylet is intended to facilitate the introduction of the canula, and the second to make the puncture.

M. Meissner performs the operation in the following manner: The patient is placed in an erect posture, and the operator, stooping down on one knee before her, first ascertains the exact position of the cervix; if this is high up, and at the same time is directed so far backwards as scarcely to be reached, the patient will have to sit down on the edge of a chair, or else lie on a settee. The accoucheur then introduces the canula armed with the blunt stylet, along the palmar surface of the index finger into the cavity of the cervix, and presses it on until it has passed the internal orifice; of course, always having the convexity of the instrument directed towards the hollow of the sacrum. When the point of the canula has once got beyond the internal orifice, it is easily slipped up between the membranes and the uterine walls, to the extent of eight or ten inches above the os uteri. After having ascertained that the point of the instrument does not rest on any portion of the fœtus, the accoucheur withdraws the olive-shaped stylet, and substitutes the trocar, with which he then punctures the membranes. The trocar is next withdrawn, a small quantity of liquid is allowed to escape through the canula, and then the latter itself is removed. After the operation is over, the woman may be permitted to sit down or walk about at pleasure. The waters gradually escape, thus lubricating and preparing the passages, and the pains make their appearance in the course of twenty-four or forty-eight hours; and, in most cases, the dilatation is soon effected, the contractions are strong, and the labor is completed in thirty-six or forty-eight hours. When the labor does not advance regularly, and the resistance from the contracted pelvis is very considerable, M. Meissner resorts to the measures usually employed under similar circumstances at term.

He has tried this mode of operating fourteen times, and he avers that both mother and child were saved in every instance; such a result, as compared with those obtained by other plans, certainly demands attention, and must encourage other practitioners to attempt it. Let us hope that the principals of large lying-in hospitals will shortly confirm, by fresh success, the favorable accounts given by Meissner.

The introduction of Meissner's canula is liable to occasion a partial separation of the placenta, and consequently endangers the lesion of some of its vessels. This, indeed, happened in a case observed by Kivisch, of Würzburg: the canula would ascend no higher than five inches, and after the puncture, nothing escaped but a little blood and serum. Not having obtained a discharge of water, it was decided two hours afterwards to puncture the ovum in the usual way. . . . Why not have directed the canula toward another point?

[M. Villeneuve (of Marseilles) substituted for Meissner's double mandril, a single one ending in a hook for seizing and rupturing the membranes. Whilst this instrument has all the advantages of the trocar, it is not liable to wound the child.

Whatever instrument is used to accomplish it, perforation of the membranes at a point high up has afforded good results, inasmuch as out of twenty-four cases recorded up to this date, all the patients survived, and twenty-two children were born alive.

Meissner's method is little used, probably because of a fear of penetrating so deeply into the womb and of wounding its walls or the fœtus, or of separating the placenta. It will always be an exceptional operation.

APPRECIATION.

The means by which labor may be brought on prematurely are, as has been seen, very numerous and have all been used with various degrees of success due not merely to the nature of the process adopted, but also to the great difference in the degree of excitability of the uterus in pregnant women. Sometimes the slightest cause will bring on contraction of the womb, in which case any process will succeed admirably; at other times it will remain completely inert under the most active stimulation, and then the very best methods become apparent failures.

The best operation is that which is the most uniformly and rapidly successful, at the same time that it affords the greatest security to both mother and child. Apart from special indications, which the clinical history of a case may supply, there are three operations to which we should accord the preference: 1, detachment of the membranes; 2, dilatation of the cervix; 3, stimulation of the circumference of the os tincæ.

1.—We would practise *detachment of the membranes* whenever the internal orifice can be entered.

2.—We would perform *dilatation of the cervix*, when it is impossible to pass the instruments through the internal orifice.

3.—*Stimulation of the circumference of the os tincæ* would be our last resort, when the two preceding methods are found to be impracticable.

We have next to compare the processes included in these three methods; but not wishing to repeat here what has already been said in describing each operation, we would call attention more especially to the *intra-uterine dilator*, *Krause's permanent sound*, *the prepared sponge*, and *uterine douches*.

To have succeeded in bringing on labor prematurely does not limit the accoucheur's responsibility: he has yet to devote much attention to the child whose imperfect development demands especial care, which is necessary in proportion to the earliness of the period at which the pregnancy shall have been interrupted. Children born at term are brought up under ordinary conditions, but those born before term require unusual precautions, upon whose proper execution success must depend. With them they often live, but without them they are almost sure to perish.

All children born prematurely require the most careful protection from cold, so that, beside the usual clothing, the whole body, the head and limbs especially, should be enveloped in a layer of corded cotton. Bottles of hot water ought also to be placed in the cradle as a permanent source of artificial heat. The temperature of the chamber in which they are kept should be maintained at about 64 degrees (Fahrenheit). If, notwithstanding all these precautions, the circulation languishes in the integuments, and the subcutaneous cellular tissue becomes infiltrated, stimulating baths, the best of which are made of wine, should be used. From time to time the children ought to be exposed naked before a warm fire, and the occasion taken to rub gently the entire surface of the body with the hand.

Their proper nourishment is not less important. It is indispensable for them to be suckled, either by the mother or a wet-nurse. When strong enough to take the breast, it is only necessary to nurse them often, but when too weak or lethargic for this, they should be made to swallow the milk previously expressed from the breast into a dessert-spoon. This ought to be done twelve or fifteen times a day, two or three spoonsful at a time being as much as they will require for the first few days. The quantity will afterwards be increased gradually, until the child is strong enough to take the breast. To the combination of all these attentions very many children born before term owe their lives; their omission almost always results in death.]

CHAPTER VII.

PRODUCTION OF ABORTION.

Premature artificial delivery requires, as just seen, certain dimensions in the diameters of the pelvis; but when the contraction is so great that the smallest diameter is less than two inches and a half, a question of the highest interest presents itself, namely, that of the production of abortion.

When a woman, three to four months pregnant, has so contracted a pelvis as to preclude all hope of a possible expulsion or extraction of a viable fœtus, may we think of inducing abortion? This question, put to Dr. Hunter, in 1768, by W. Cooper, was shortly afterward decided in the affirmative by most English practitioners. The propriety of the operation was also acknowledged in France, by Fodéré (1813), Marc (1821), Velpeau

(1829), and by ourselves (in 1840), in the first edition of this work. In 1843, M. P. Dubois published an article in the *Gazette Médicale*,—an article which foreshadowed his opinion, although it did not positively express it. About the same time, M. Simonard, of Brussels, published a dissertation, in which, after showing the morality of the operation, he points out the indications. Finally, MM. Stoltz, Jacquemier, and Chailly, have adopted the views of the English accoucheurs.

Too many imposing authorities have pronounced in favor of producing abortion to make it necessary for us to stop in order to discuss the moral, religious, and medico-legal questions which this operation has raised.[1] Like premature delivery, it is now received as an obstetrical operation, and it only remains for us to determine the indications, and the most expeditious and least dangerous means of accomplishing the object.

1. The extreme contractions of the pelvis, those which afford the woman at the term of her gestation only the sad choice between embryotomy and the Cæsarean operation, and for a still stronger reason, those which, by affording less than two inches to two inches and a half, allow of the extraction of a dead or living fœtus *only* by incision of the abdomen, constitute the most positive indication for producing abortion. If, indeed, as we shall endeavor to prove in the following chapters, the sacrifice of the child is fully justifiable when the choice only lies between hysterotomy and embryotomy, this sacrifice would be still more rational at a period of gestation in which the operations necessary to the production of abortion are much less dangerous than those which the mutilation and extraction of a fœtus at term would require. For our own part, therefore, we think that the accoucheur is warranted in producing abortion, whenever a woman, who is five or six months pregnant at the most, shall have less than two and a half inches in the smallest diameter of the pelvis.

2. Contractions of the pelvis are not the only cases in which it has been proposed to produce abortion. A host of accidents connected with the pregnant condition, and a multitude of coexisting morbid phenomena, all becoming very dangerous to the mother in consequence of this coincidence, have appeared to some physicians to be quite as rigorous indications as the pelvic contractions. We cannot partake of this view, at least as respects the majority of cases. The precepts laid down by us in treating of *premature delivery*, require to be greatly modified when *abortion* is concerned. In a grave case, indeed, but one in which the issue is only *probably* favorable, we may conclude to induce labor after the seventh month: the danger to which the mother is *probably* exposed certainly legitimizes an operation which affords considerable chance of saving the child's life. The same is by no means the case as respects the production of abortion; here it is no longer sufficient that the mother's life is *probably* compromised, it should be *almost* certain that death is imminent. Under this head, hemorrhages that have resisted all kinds of treatment, irreducible displacements of the womb, extreme dropsy of the amnion, tumors of the soft parts which cannot be displaced, punctured, incised, or extirpated, seem to me to be the only ad-

---

[1] For further details, see M. Cazeaux's report to the Academy of Medicine and the discussion which followed it. (*Bulletin de l'Académie et l'Union Médic*

missible indications for the production of abortion. The same may be said of those cases of obstinate vomiting which threaten a speedy termination of the mother's life (see page 477.) On the contrary, it ought not to be performed for nervous disorders, and chronic or acute diseases complicating gestation. As regards eclampsia, it is rare in the first half of pregnancy, and the slowness with which the abortive measures act at a very early period, seem to me to be a formal contraindication. (See p. 813.)

To recapitulate, extreme contractions of the pelvis, voluminous, immovable, and non-operable tumors of the excavation, extreme dropsy of the amnion, irreducible displacements of the womb, and hemorrhages which have resisted the employment of the most rational measures, we consider to be the only indications for abortion. Some authors have admitted a greater number, but only for want of distinguishing clearly between abortion and premature labor.

The only contraindication is the formal refusal of the mother; for with her alone, after all, remains the right to decide the question.

Whilst respecting the scruples of certain minds as respects a deformed woman upon whom abortion has been once practised, I confess that it would not deter me for an instant in a succeeding pregnancy. We have no right to constitute ourselves judges of the morality and of the antecedents of the patient who demands our assistance. Even supposing that we have to do with one of those unfortunate creatures who will trample under foot the most sacred feelings, and give way all the more to their passions, because they think they can find impunity for their bad conduct in the humanity of the surgeon, we owe her none the less our care; for us, the only question to resolve in the second, or third, as in the first pregnancy, is, whether the conformation of that woman allows us to hope for the extraction of a viable child.

It, therefore, only remains for us to determine the period at which it is proper to operate, and the most advantageous methods.

None but the contractions or obstructions of the pelvis permit the accoucheur to choose the most favorable moment, and then the only precaution to be observed is to wait until the pregnancy can be certainly determined, that is to say, between the fourth and fifth months. In all other cases, it is necessary to act as soon as the gravity of the accidents have no other alternative.

[*Modes of Operating.*—All the methods described for the induction of premature labor may be employed; but inasmuch as during the first half of gestation the womb is but slightly contractile and susceptible of stimulation, the most active means should be preferred. The use of the tampon, after Schœller's or Braun's plan, is often ineffectual; the prepared sponge, although more efficient, is liable to act with the most discouraging slowness, and the same may be said of Kiwisch's injections. The two plans which seem to us the most likely to succeed are, detachment of the membranes and puncture of the ovum.

Detachment of the Membranes.—This is generally done with a metallic sound, which is passed over as great a surface as possible. Although the operation is, apparently, very simple, it is often really very difficult, and the most skilful hands have sometimes been unable to perform it.

We produced abortion three times by means of the intra-uterine dilator; once for obstinate vomiting, and twice on account of extreme contraction of the pelvis. In the first case, the abortion was effected in a few hours, and the patient recovered. In a second (contracted pelvis), it was over in less than forty-eight hours. This last case has especial value from the fact that Prof. Dubois had the greatest trouble in a previous pregnancy in producing abortion; douches in great number had been given without result, several applications of prepared sponge had been fruitless, and expulsion of the ovum was only brought about by introducing large bougies into the uterus.

The third case of abortion, provoked by the intra-uterine dilator, was both less perfect and less rapid; the patient being a woman affected with osteomalacia. The dilator was used without difficulty or pain during the fifth month of gestation. Five days afterward the cervix was, in great measure, effaced and partly opened, but the instrument still remained within the womb. To stimulate the labor I used Barnes' dilator, and soon afterward the abortion took place.

In these three cases the patients recovered without accident, so that the results were sufficiently satisfactory to authorize its use in the future.

Puncture of the Ovum.—As an operation for the induction of premature labor, puncture of the ovum, notwithstanding the certainty with which it acts, is liable to the great objection of compromising the life of the child, and on this account it is almost entirely abandoned. But, as in case of abortion the fœtus is not viable, puncture of the membranes is a valuable method. The only objection to it is the difficulty of certainly reaching the ovum. The method is the same as for premature labor.

Whatever means are employed, it is to be expected that the expulsion will take place very slowly. This will seem reasonable, inasmuch as spontaneous abortion is usually very tardy.]

CHAPTER VIII.

OF SYMPHYSEOTOMY.

THE relaxation of the pelvic symphyses, and the consequent separation of the articular surfaces, which often occur during pregnancy, have so long been known to the profession, that it is somewhat surprising the operation in question was not sooner suggested. It should be stated, however, that certain reflections, and even some facts well worthy of attention, are scattered here and there throughout the annals of our science. For instance, Severin Pineau, when treating of the relaxation of the pelvic ligaments, quotes the text of Galen, and seems to anticipate the Sigaultian operation; since, in speaking of the pelvic articulations, he says, *Non tantum dilatare, sed etiam secari tuto possunt.* In a work published by Delacourvée, a French physician, in 1655, we find that, being summoned to a pregnant woman, who died near full term, he divided the pubic symphysis with a razor, in order to extract the child more readily. In 1766, Plenck, under very similar circumstances, first performed the Cæsarean operation; but, being unable to extract the head, which was low down in the excavation, he divided the symphysis, and was successful in delivering the child. But this early attempt, instead of leading to the performance of this operation on the living female, seemed to have the opposite effect.

In fact, it was only towards the end of the last century (in 1768) that Sigault, then a student of medicine, suggested it to the Aca gery, by whom it was rejected as a rash proposal. Not disconcerted by this reception, young Sigault supported his invention in a thesis at Angers, in 1773; that is, five years after the presentation of his original memoir; and, finally, in 1777, he performed his first operation, assisted by Alphonse Leroy, who declared himself its zealous partisan. The mother and child were both saved; and, on account of his success, Sigault, who had been almost reviled by the Academy of Surgery, was thenceforth covered with honors, and regarded as a benefactor of humanity. The Faculty of Medicine at Paris even resolved to celebrate this wonderful discovery by having a medal struck in honor of its author. But, notwithstanding its early success soon gained him numerous followers, it also stirred up new and bitter adversaries: and the medical world was for a long time divided into two sets of enthusiasts, the *Symphyseans* and the *Cæsareans;* but, after their first ardor had abated, both parties finally settled down in a common opinion, as soon as they discovered that there had been exaggerations on each side. Since that time, the Cæsarean operation and symphyseotomy have been alike regarded as useful operations, applicable to certain particular cases; and, so far from attempting to exclude either, the more modern writers have rather endeavored to designate the conditions requiring their respective employment; which, indeed, would have been the wiser course at the time of its first discovery.

§ 1. EFFECTS OF SYMPHYSEOTOMY.

Supposing the propriety of the section of the symphysis pubis to be admitted for the moment, let us ascertain what advantages could be derived from it. From the best works published on this subject, it would appear that we cannot hope to gain more than four to six lines in the length of the antero-posterior diameters of the superior strait and excavation. After a division of the inter-pubic cartilage, the bones of the pubis separate spontaneously from four lines to an inch; which separation is produced by the retraction of the ligamentous fibres, known as the posterior sacro-iliac ligaments. While this is being effected, the coxal bone may be considered as a lever of the first kind, having its long anterior arm bent near the middle; the centre of movement, or fulcrum, is found at the posterior part of the articular surface of the sacrum. During the separation, the ligaments situated on the front part of the sacro-iliac articulation become tense and stretched, or even lacerated, when this is carried to a high degree; consequently, the amount of their resistance greatly influences the degree of separation. Again, if the accoucheur, by taking hold of the iliac crests, attempts to draw them asunder, he may considerably increase the interval already existing between the pubic bones; but it would be imprudent to carry this artificial separation too far; because, if carried beyond two inches, the anterior sacro-iliac ligaments would probably be ruptured, and the mother be subjected to very serious consecutive inflammations. The antero-posterior diameter of the strait is increased from two to three lines for every inch of separation between the pubes; and, since this interval may amount to two inches, four to five lines are therefore added to the length of the sacro-pubic diameter. In addition to which, the anterior parietal protuberance, by engaging in the space left between the pubic bones, diminishes the biparietal diameter to a corresponding extent; and it has been calculated that two to three lines are gained in this way; which would give a sum total in the increased length of the sacro-pubic diameter of six to eight lines.

But the sacro-pubic is not the only diameter augmented by symphyseotomy; for the oblique, and more particularly the transverse, ones are thereby greatly enlarged. In fact, the researches of Desgranges would seem to prove that the increase in the transverse direction, throughout the whole pelvis, amounts nearly to one-half of the separation at the pubis; and that the transverse enlargement of the pubic arch is almost equal to the whole of this interval. Whence it follows that the operation, which would appear to be applicable to those cases only in which the contraction affects the sacro-pubic interval, is in reality especially advantageous when the transverse diameters of the excavation, or of the inferior strait, are shortened.

§ 2. Indications for Symphyseotomy.

The results furnished by experiments made on the dead body, naturally lead to the conclusion that this operation is practicable whenever five to eight lines, added to the contracted diameters, would prove sufficient to admit of a spontaneous delivery, or, at least, of an extraction of the fœtus by the forceps. Such is the view adopted by most practitioners since the days of Sigault, and the extremes of the operation have been limited to two and a half inches for the lowest, and three and a quarter inches for the highest. But, at the present day, symphyseotomy is seldom resorted to, and it will be even less so hereafter, when accoucheurs generally shall have learned to appreciate the advantages derivable from the induction of premature labor.

The circumstances that have led to the performance of the Sigaultian operation, are equally strong in favor of the induction of premature labor; and the results deduced from experience, the only impartial judge in such cases, have already decided in behalf of the latter operation. For, whenever a patient comes under care during the last two months of her pregnancy, whose pelvis ranges from two and a half to three inches in its smallest diameter, we ought to bring on the labor before term; more particularly if a mutilation of the fœtus has been deemed necessary in a former confinement; and, on the other hand, we have elsewhere shown (page 672) that, whenever there is reason to believe that the child's life is more or less compromised by the previous duration of the labor, and the unsuccessful attempts resorted to for its extraction, the accoucheur should act as if it were really dead. Hence symphyseotomy should only be performed, even though the pelvis measures from two and a half to three inches in its smallest diameter, when the operator ascertains the existence of the deformity before the membranes are ruptured.

For, even admitting that it were not better to sacrifice the infant's life than to perform an operation which so often endangers the existence and commonly the health of the mother, is it always possible, in practice, to conform strictly with theoretical principles? The cases in which a similar degree of retraction has permitted the spontaneous expulsion of the fœtus naturally suggest themselves to the mind; and although these exceptions to the rule are certainly rare, yet they may reoccur. Consequently, is it not prudent, before alarming the patient, to ascertain, by a proper delay, the inefficiency of the uterine efforts? Is not such a delay indispensable for proving the necessity of the operation? In most instances, would it not require several hours to induce the patient to yield to the entreaties of her family? Would the relatives themselves consent, before the lapse of time had convinced them of the absolute impossibility of a natural delivery? And would they not demand a trial of all other means, before a resort to such an extreme measure? Could the accoucheur object to an application of the forceps, which has so many times, under like circumstances, been followed with success? Or could he refuse, had he, like ourselves, seen a living fœtus expelled at term through a pelvis whose antero-posterior diameter measured but three inches? These uncertainties, hesitations, and forced delays, which a firm and resolute physician having charge of an hospital may escape, are inevitable in private practice, where we have the fears of the family, the resistance on the part of the patient herself, and oftentimes the anxiety caused by the jealousy of some of our own brethren, to contend with; during all which, time runs away, the labor is progressing, the membranes are ruptured, and the favorable chances for performing the operation are lost. It will be said, *perhaps* the slowness of the labor is more dependent on the feeble contractions than on the disproportion between the diameters of the head and those of the pelvis; or, *perhaps* a little artificial aid joined to the powers of nature will succeed in accomplishing her work. But while thus wavering from hope to hope, from *perhaps* to *perhaps*, the labor reaches that stage where we begin to doubt the viability of the fœtus; and, when such a doubt arises, can we any longer think of resorting to symphyseotomy?

This operation has been proposed in other cases, besides those dependent on a contraction of the pelvis; as, for instance, for tumors in the excavation, for a very large head, or a retroversion of the womb, occurring during the early months of gestation. Thus, it was resorted to by Duret, in order to overcome an obstacle to the engagement of the head, created by the development of an exostosis, about the size of a nut, on the first false vertebræ; as also in the following case, published by Dr. Damman, in Casper's journal: A woman had been three days in labor, but the head was so voluminous that it could not engage in the excavation, notwithstanding the perfect conformation of the pelvis; and, having become wedged in the superior strait, an application of the forceps was impossible. Although the long duration of the labor ought naturally to have created some doubt with regard to the child's condition, yet M. Damman resorted to symphyseotomy; the infant was born dead, but he was fortunate enough to save the mother.

The remarks before made with regard to this operation in cases of deformed pelvis, equally apply to those of tumors in the excavation, and to those in which the excessive size of the child's head constitutes the only obstacle to a spontaneous delivery. As to its utility or disadvantages when resorted to for the purpose of facilitating the reduction and correction of a retroverted uterus, experience is still wanting.

In our estimate of the indications for this operation, we cannot conform, as the reader will see, to the rules laid down by its partisans; because, so far from being precise and positive, as they suppose, these rules only leave the practitioner in doubt and uncertainty. Laying aside for a moment all theoretical discussions, and looking at the question only in its practical point of view, we are led almost irresistibly to the conclusion that, in the present state of our science, symphyseotomy is no longer practicable. For, independently of the difficulties in determining its indications precisely, it must not be supposed that the operation is attended with as little danger as Sigault and Alphonse Leroy endeavored to prove; and we only need refer to the numerous accidents thereby produced to sustain the justice of our conclusions. In fact, these dangers are so great that, according to Baudelocque, of forty-one females operated upon, fourteen died, and thirteen children only were born living! Not to allude to the numberless infirmities that embittered the existence of nearly all the patients who survived the operation.

Operation.—This is very simple. The woman, being placed in the same position as if the forceps were to be applied, is properly supported by assistants; the bladder is emptied, and the catheter left in the urethra for the purpose of protecting this canal from the edge of the knife, by pressing it towards the right side. The operator depresses the skin covering the pubis, so as to find the precise spot for cutting down on the symphysis. This being done, an assistant stretches the skin upward as much as possible, and the surgeon then makes an incision through the soft parts, commencing about half an inch above the symphysis, and prolonging it downwards over the centre of the articulation, nearly to the clitoris, and terminating a little to the left; the inter-pubic ligament is then carefully incised, and, when it is nearly cut through, great precaution is requisite not to wound the bladder. As soon as the section is effected, a separation of the pubes follows; when, if the patient's strength is not exhausted, and the uterine pains are still strong and frequent, the further delivery is abandoned to nature; but in the opposite case the forceps is applied, or the labor terminated by the pelvic version and by tractions on the lower extremities. After the delivery is completed, the patient is cleansed, and the vessels tied, if any were divided; the pubic bones are drawn together, and the lips of the wound sustained by adhesive strips, charpie, and a compress, and the whole retained *in sitû* by a bandage around the body. The symptoms subsequently manifested are to be carefully combated as they arise. The perfect consolidation of the symphysis is seldom completed under three or four months, even in the most favorable cases, and instances have been known where this never occurred, though the patients were ultimately enabled to walk, by the formation of a cellulo-fibrous tissue; which, says Alphonse Leroy, by filling up the space in the symphysis, restores the solidity of the articulation.

This process is the one generally followed; but numerous modifications of it have been suggested, most of which are intended for the better protection of the urethra; though none of them, however, are of much value. Attributing the consequences that follow in the train of symphyseotomy to the exposure of the articular surfaces and the lips of the womb to the external air, M. Imbert, of Lyons, has proposed the division of the inter-pubic cartilage, without involving the skin. This procedure is feasible enough; but, in our estimation, it can only obviate the smallest part of the consecutive accidents; for the various dangers to which the patient is then exposed, are far less dependent on an inflammation of the pubic symphysis than on the disorders created by the separation of the sacro-iliac articulations.

These remarks apply with equal force to the division of the pubis, which Professor Stoltz advises to be performed by the subcutaneous method. But, after the opinion I have advanced with regard to the operation itself, it seems unnecessary to dilate on the different ways of performing it; I must, however, describe that of the Strasbourg professor, for, although experience has not decided on its relative merits, yet it seems to offer the most favorable chances.

It consists in the division of one of the pubic bones near the symphysis, by means of a chain-saw, without incising the integuments. The skin having been previously shaved, a small opening is made on the mons veneris at the point corresponding with the crest of the pubis, either on the right or left side of the symphysis; a long and slightly curved needle, having the saw attached, is then entered at this opening, and slipped along the inner face of the pubis, grazing the bone, and its point is brought out at the side of the clitoris, between the cavernous body and the descending branch of the pubis from which the latter arises. The handle is next fitted on, and, taking the saw by both extremities, it is moderately stretched between the two hands, and the pubis is cut through by a few strokes. The divided portions of the bone immediately separate, and this separation can be increased almost at will, or it may be effected by the direct pressure of the child's head or trunk. The pubis being divided, one of the handles is removed, the instrument is withdrawn, and the small opening which is left behind heals up without difficulty.

But I repeat, that the modifications suggested by Stoltz and Imbert still require the sanction of a more extended experience.

CHAPTER IX.

OF THE CÆSAREAN OPERATION.

Hysterotomy, or the Cæsarean operation, consists of an incision through the abbominal and uterine walls, for the purpose of extracting the child.

This section has been recommended in cases where a pregnant woman died undelivered, long before it was resorted to on the living female; and it can readily be traced back to remote sources worthy of credit, without confounding it with the mysteries of the poets, or with the marvels of antiquity. Thus, Valerius Maximus speaks of the posthumous birth of the philosopher Gorgias; and Pliny states that the celebrated Scipio Africanus and Manilius were saved under Numa's law, which interdicted the interment of a woman, big with child, until her belly was opened. This wise and prudent law was received and adopted throughout Christendom, and it still flourishes vigorously in the Roman Church.

The precise period at which the operation was first performed on the living patient remains undetermined. Mansfield, of Brunswick, endeavored to discover indubitable traces of it in the Talmud; but one of his contemporaries has wholly refuted such an opinion. According to M. C. Lage, the first authentic case was reported by Nicolas de Falcon, in 1491; J. Nufer performed it in 1500, as detailed by Gaspard Bauhin; and F. Rousset published a work in 1581, which has since acquired considerable celebrity from the great number of cases it contains, all of which were successful.

The surgeons were so emboldened by Rousset's monograph, that the Cæsarean operation was often resorted to without any indication whatever, and its popularity became so great at one time, that a contemporary Dominican friar, Scipia Merunia, affirms that it was as common in France as blood-letting in Italy. However, a reaction soon took place; for Guillemeau, Paré, Viard, and some other prominent surgeons having failed in their attempts, Marchant succeeded in stirring up his countrymen against Rousset, by founding some virulent attacks on these reverses; and the Cæsarean section would have fallen into oblivion, if Gaspard Bauhin had not come to its aid with fresh proofs in its favor.

The interesting and delicate question of hysterotomy was again contested during the whole of the seventeenth century, and then, as in the preceding one, its advantages and disadvantages were grossly exaggerated; so that the following century arrived without any clear idea having been formed respecting the operation or its value, owing to the total want of probity and justice in the examination of the facts of the case. In 1749, Simon read a remarkable memoir on this subject before the Royal Academy of Surgery; but it was characterized by credulity rather than accuracy. Since that period, most of the works on the Cæsarean operation have merely discussed the indications for its performance; but not one of them unless it is Sacombe's passionate and scandalous dissertation, has attempted to prove the impossibility of its proving successful. Although the favorable are not very numerous, yet there are a few that may clearly be considered as incontestable. In our day, the field for the Cæsarean, as well as for all other obstetrical operations, has been limited; but this is rather to be attributed to the advance of science, and to the eminently practical spirit of the present age.

This operation may be practised on the living female whenever the natural passages through which the child has to pass are so narrow, or so obstructed, that a delivery by the application of the forceps, or by symphyseotomy, is wholly impossible; and when the mutilation of the child itself would not permit its extraction without exposing the mother to the greatest dangers. It may likewise be resorted to for the purpose of saving the infant when the patient dies in the advanced stages of gestation.

§ 1. CÆSAREAN OPERATION ON THE LIVING FEMALE.

When practised on the living female, the Cæsarean section constitutes one of the most serious operations in surgery; for three-fourths of its unfortunate victims have perished. This result, which would probably be still more unfavorable if the same pains had been taken to bring before the public the unsuccessful, as have been used to circulate the more fortunate cases, is, indeed, calculated to alarm the surgeon who is obliged to contemplate performing such an operation.

All accoucheurs agree in the opinion that, when the smallest diameter of the pelvis does not amount to two and a half inches, a delivery by the natural passages is absolutely impossible; and that we have then only to choose between hysterotomy and a mutilation of the fœtus; it was stated, however (page 646), that M. Depaul mentions two cases in which the children were born alive through a pelvis contracted to two and three sixteenths inches.

Supposing the smallest diameter measures two and one-eighth inches, and it has been positively determined that the child is still alive (for the question is no longer doubtful when there is the least uncertainty on this point), two different measures are presented for our serious consideration, namely, embryotomy and the Cæsarean operation. All the French accoucheurs, including Dubois himself, are in favor of the latter, for he says, "The Cæsarean operation is our only resource, and, therefore, it must be resorted to." (*Thèse*, p. 71.)

We are not ignorant of the importance of this question; and it requires a settled and positive conviction, on our part, to warrant us in deciding it differently from other French authors; but we are sustained by the almost unanimous opinion of the English practitioners, who believe that the child ought to be sacrificed whenever the delivery can be effected by embryotomy. Long ago, we strongly expressed a desire (in the first edition of this work), to see the views of our neighbors more generally disseminated in France, in the following words: "And, as to ourselves, our voice will be against the Cæsarean operation in all cases where it is not absolutely indispensable to the mother's safety." And we do not hesitate now to advance the same doctrine. In fact, it cannot be forgotten that this operation is nearly always fatal to the female, even admitting that the statistical tables exhibit the exact truth. For instance, laying aside the details contributed by the surgeons of Great Britain, who are charged with the non-performance of the operation at the opportune moment, and supposing that the unsuccessful cases have been as honestly reported as the successful ones, an impartial examination of all the facts leads to the melancholy conclusion, that nearly four-fifths of the mothers have perished; (according to Keyser, the precise ratio of mortality is seventy-nine per cent.) The question then recurs, does this frightful operation save the child? Or is it at all certain that we can present to the mother, as a compensation for all her sufferings, something more than a lifeless corpse? Unfortunately, this is not the case, and the partisans of the Cæsarean section are constrained to acknowledge that they are not always fortunate enough to extract a living child, even when the operation is performed at the most favorable moment. But admitting for an instant that, if resorted to immediately after the membranes are ruptured, the section will always save the child, still this, in my opinion, does not compensate for the dangers to the mother.

You confess that more than one-half of the females die, but can you aver that more than a moiety of the children you save by gastrotomy will live long enough to dry the tears shed over their birth? Read the tables hitherto published on the average of human life, and then tell me whether fifty, out of a hundred living infants, attain their thirtieth year.[1] Wherefore, it is not only the immediate effect of gastrotomy, but also its remote consequences that are to be taken into consideration. This at least is certain, that you sacrifice more than half of the women immediately; and, even supposing that every child was alive at the time of its birth, the experience of ages has proved, that you will not find one-half of them attain the age at which their mothers died.

The advantage is, therefore, in favor of embryotomy, when considered with regard to the mere question of figures. But the feeble and uncertain life of an infant, who is connected with the external world only through its mother, who as yet has neither thought nor affection, hope nor fear, can it be compared to that of a young woman associated with those around her by a thousand social and religious ties? Or will the survival of this poor child fill up the void left by the death of its mother? And, lastly, can society at large ever hope to receive from a new-born infant the duties it had a right to expect from the adult woman? Hence, family ties and social interests all militate in favor of the mother.

In a political, if not in a moral point of view, we are clearly justified, says Ramsbotham, in preferring the strong to the feeble, the sound man to a diseased one, and, consequently, the mother of a family to the still unborn infant, whenever we are placed under the cruel necessity of sacrificing the one or the other. One more argument yet remains in favor of the view I adopt: the most ancient of all the principles of morality, the foundation of all medical law—is, that we should treat our patients as we would treat ourselves or our dearest relatives; now, where is the physician who, if forced to decide under such circumstances between the life of his wife and that of the child she still bears in her womb, would hesitate to authorize the sacrifice of the latter?

[We may conclude from what has just been said, that embryotomy and not the Cæsarean operation, ought to be performed whenever the pelvis is large enough to allow the cephalotribe to be introduced. Therefore, notwithstanding M. P. Dubois' authority, we think that the latter instrument should be resorted to not merely in pelves contracted to two and one eighth inches, but also in pelves of two inches only. Below two inches, the extraction of the mutilated fœtus is so difficult, long, and painful, that, besides the necessary destruction of the child, the mother is exposed to great danger. At this point therefore, there may be some hesitation as to the choice between the Cæsarean operation and embryotomy. We would add, however, that M. Pajot regards cephalotripsy as preferable to the Cæsarean operation not only in a pelvis of two inches, but even in one of one and one eighth inches, (see *Embryotomy.*) Only below the last-named dimensions would this professor decide to perform hysterotomy.]

---

[1] From the investigations of Villermé, it appears that in France 20-100 of the inhabitants in the wealthy departments die at one year of age, and 22-100 in the poor ones; 31-100 in the wealthy departments and 33-100 in the poor ones die at four years of age; 38-100 in the former and 42-100 in the latter die at ten years; and, finally, at twenty years, rather more than 42-100 die in the wealthy departments, and 49-100, that is to say nearly one-half, in the poor ones. Yet these figures do not include children abandoned by their parents, of whom, notwithstanding the zeal of public charity, at least 60 out of every 100 die in Paris within the year.

M. Villermé's researches are confirmed by those of M. Benoiston, of Chateauneuf.

This rigorous exclusion seems to us warranted by the facts we have witnessed and the record of results of operations performed in large cities, and especially in great hospitals. It is thus shown that the immense majority of patients have perished; we have, however, to repeat, that for some years past quite a number of cases have been published by honorable physicians practising in the country or small towns, and that their aggregate results would make the operation much less serious than when performed in large cities. This fact ought evidently to be taken into consideration, and render less warrantable the preference we accord to embryotomy in the case of women out of the great centres of population. If indeed, it be true, and we think it is so because our confrères affirm it, that in the country three-fourths and even four-fifths of the women who suffered the Cæsarean operation recovered, we have no hesitation in giving it the preference in country practice, whilst maintaining our first conclusion in reference to its performance in large cities.

The almost constant failure of the operation in large cities, such as London and Paris, as compared with the successes obtained in smaller localities, has suggested to some individuals the propriety of erecting a hospital in the country, or at least of sending out of town such patients as it is supposed will require the Cæsarean operation. This precaution is especially insisted upon by M. Guisard, who has just published three new cases of success. The idea could not be carried into execution very easily, yet I think it deserves to be considered, and suggested to the proper authorities. What we have just stated in regard to the difference in the results of operations performed in town and in the country, is calculated to make a strong impression, even upon minds which are strongly opposed to M. Guisard's proposition. All who have had long experience of the diseases of lying-in women, are convinced that most of them originate in the assemblage of a large number of newly-delivered patients in the same place; and this is especially true as regards those whose labors were difficult, and required a bloody operation. To increase the number of lying-in institutions, and to separate the patients as much as possible, I regard as the surest means of obtaining an early convalescence.

It must not, however, be supposed that by sending to some leagues' distance from Paris such deformed women as will require our care at term, they will be placed in as favorable conditions as women who have always lived in the country. The gravity of the operation is certainly influenced by the locality in which it is performed, but so it is also by the health of the patient; now we know that in this respect there is great difference between the women of cities and those who have always resided in the country. To afford them the best chance, therefore, these unfortunate persons ought to be placed in the best hygienic conditions for several months before the end of gestation.

Supposing the necessity for operation has been fully determined, numerous important questions arise for consideration, namely, what is the most favorable stage of the labor for its performance? Has the previous duration of the labor any positive influence over the result? And is it better to operate before or after the membranes are ruptured? An answer to all these questions will be found in the careful examination of the published cases.

A. *Duration of Labor.*—The whole duration of the labor has been noted in one hundred and sixty-four cases; in sixty-two of which the woman recovered, and in one hundred and two she was lost. With a view of showing the influence of duration as regards the mother, we divide these cases into three classes, namely:

Where the operation was performed after the labor had lasted twenty-four hours, there were	20	successful and	40	unsuccessful cases.
From 25 to 72 hours, there were .	34	"	21	" "
More than 72 " " . .	8	"	21	" "
	62		102	

From this table, which is taken from Keyser's excellent work, we may conclude that the duration of the labor would appear to have an unfavorable influence only when it has continued beyond seventy-two hours.

But the same remark does not apply to the child; for, taking the same one hundred and sixty-four cases, in a hundred and fifty-eight of which the infant's condition is reported, we find that fifty-seven were still-born, and a hundred and one survived; and, adopting the same division, we have:

After a duration of 24 hours, .	42	successful and	16	unsuccessful cases.
From 25 to 72 " . .	48	"	24	" "
More than 72 " . .	11	"	17	" "
	101		57	

Whence it follows that the chances are less for a living child as the labor is the more prolonged.

B. *Rupture of the Membranes.*—The time that elapsed after the membranes were ruptured has been stated in one hundred and twelve cases. We shall likewise classify these under three heads, according to whether the operation was performed:

		As regards the Mother.	
	Cases.	Successful.	Unsuccessful.
1st. Before or within 6 hours after the membranes were ruptured, ... =	39	20	19
2d. From 7 to 24 hours after the rupture, . . =	35	14	21
3d. More than 24 hours after the rupture, . . =	38	13	25
	112	47	65

From which it appears that the operation is so much the more unfavorable for the mother as a greater time has elapsed after the rupture of the membranes.

The fate of the child is known in only one hundred and six cases; still using the same classification, we have:

	Cases.	Successful.	Still-born.
1st. Before or within 6 hours after the rupture, . =	37	34	3
2d. From 7 to 24 hours after the rupture, . . =	32	25	7
3d. More than 24 hours after the rupture, . =	37	19	18
	106	78	28

c. It is unnecessary to add that, with regard to the fœtus, the prognosis is much more unfavorable when an artificial extraction has been attempted before resorting to the Cæsarean section. Indeed, it must be evident, from the foregoing facts, that the most favorable time for operating is either before or immediately after the rupture of the membranes.

Whenever we have an opportunity of attending the patient during the last few days of her pregnancy, it is advisable to prepare her for the operation by a suitable regimen, such as tepid bathing, moderate blood-letting, &c. But when the labor has actually commenced, the operation is to be proceeded with as soon as the os uteri is sufficiently dilated to permit the subsequent discharge of the lochia. It has been recommended to puncture the membranes, lest the waters be effused into the peritoneal cavity; but as this accident can very easily be prevented, and as the distention of the womb is favorable to the retraction of the organ after the operation, this ought not to be done. Just before commencing, the bladder and rectum are to be emptied. Two bistouries, the one convex, the other having a straight probe-pointed blade, forceps, ligatures, cold and tepid water, a little vinegar, sponges, needles armed with thread, quill-barrels, strips of adhesive plaster, some charpie, and compresses, and a bandage for the body, constitute the necessary apparatus.

The patient is then laid on a bed of the proper height, and is held quiet by the attendants; an intelligent assistant is charged with the duty of keeping the womb on the median line by placing his hands over it; and another presses one hand over the fundus uteri, with a view of keeping up the intestines, which are apt to become insinuated between the uterine and the abdominal walls. The surgeon then makes an incision along the median line, through the skin and subcutaneous fatty tissue, extending from a little below the umbilicus, downwards to within an inch and a half or two inches of the pubis; this incision ought to be at least five or six inches long, and provided this extent is not obtained within the indicated points, in consequence of the woman's low stature, it should be prolonged a little upwards and to the left of the umbilicus. The operator next divides the aponeurotic fibres of the linea alba, layer by layer, and thus gets to the peritoneum, into which he then makes a small opening; having inserted the index finger of the left hand into this, he directs the probe-pointed bistoury along its palmar face and enlarges the incision. The tissue of the uterus is now carefully incised, layer by layer, until the surface of the membranes or the placenta is brought into view; the bag of waters is then opened by a simple puncture, and the probe-pointed bistoury is entered at this orifice, and the incision enlarged to the extent of five or six inches, directing it rather toward the superior than the inferior angle of the external wound. The assistant, who is charged with the duty of keeping the lips of the wound apart, must be very careful to hold the abdominal and uterine walls in contact with each other at the time when the membranes are ruptured. The extraction of the fœtus is afterwards accomplished by seizing hold of the first extremity that presents. The uterus retracts immediately and effects the detachment of the placenta, which is pushed towards the wound; it is then extracted together with the membranes, which have been carefully twisted into a cord.

If any blood has escaped into the uterine cavity, it is removed, as well as any other foreign body that may obstruct the cervix.

The wound in the uterus requires no other attention than that of being well cleansed. The lips of the one made through the abdominal walls are brought together at two or three points by the twisted suture, taking care to leave a free space towards its inferior part for the discharge of the fluids that escape from the abdomen; strips of adhesive plaster are used between the points of the suture, over which the uniting bandage is then applied; some modern surgeons use no sutures, relying wholly upon uniting bandages for keeping the edges of the wound in apposition. Thus M. Lebleu (of Dunkirk) first places beneath the patient, and opposite the last dorsal and lumbar vertebræ, two narrow body bandages with digitated extremities. Upon these, so as to come next to the skin, are laid two strips of adhesive plaster, each four inches wide, but long enough to cross each other in front of the incision. Each strip is cut into three from its extremities for three-fourths of its length. After the operation, the ends of the adhesive strips are applied first to the skin, and then, as they come near the wound, upon two thick graduated compresses placed on each side. They are made to cross each other opposite the incision, leaving only a small open space below. Charpie, compresses, and the two body bandages complete the dressing. This arrangement seems to me well adapted to the case. The wound is next covered with charpie smeared with cerate, and common compresses, and the whole retained *in sitû* by a moderately drawn body bandage. The subsequent treatment is restricted to combating the inflammatory and other symptoms as they may arise.

As one of the means best adapted to prevent undue inflammation, Dr. Metz (of Aix-la-Chapelle) insists strongly upon the use of cold. As soon as the patient is placed in bed, compresses saturated in cold water are applied to the abdomen, and followed in a few hours by ice inclosed in bladders. Injections of cold water are also administered, and the patient caused to swallow small fragments of ice.

She is herself conscious, says M. Metz, of a degree of comfort, resulting from the action of the cold, which is a sure guide to indicate the point to which it is best to carry it. The final effect of the cold is the production of discomfort, and should the use of it be continued, an unfavorable reaction might result. Should the cold injections or swallowing of ice bring on diarrhœa, they must be stopped and replaced by enemata of starch and laudanum. If, on the contrary, the injections do not soon produce stools, calomel or castor-oil ought to be administered.

The use of cold has never seemed to interfere with the regular accomplishment of the puerperal functions.

M. Metz relates eight cases of his own, showing but one death. Five others, two being furnished by Dr. Vossen, one by Dr. Kesselkaul, and two by Drs. Kilian and Gentz, also exhibit a favorable result. We have therefore twelve cases of success out of thirteen operations.

For our own part, we are quite in favor of adopting the plan of M. Metz, inasmuch as we have twice seen newly delivered ladies apply in spite of us, and without the least inconvenience, cold compresses upon the abdomen and breasts. We are not, therefore, alarmed for the consequences which, *a priori*, we should have feared from the continued action of cold, yet we are unable to think the results obtained by M. Metz as encouraging as he believes them to be. Very probably the future will undeceive him sadly. Still, we have been impressed by the memoir of the Aix-la-Chapelle physician, and do not hesitate to recommend a method which gave him such results, convinced as we are that no serious objection applies to it.

Several modifications of the operation have been proposed, all of which we think it useless to mention, inasmuch as the success attributed to them was, I believe, owing much more to the special conditions under which they were performed than to the more or less ingenious plans suggested by their authors.

There is one, however, which deserves mention, if only on account of the hopes which it at first awakened; it consists in performing the operation without wounding the peritoneum, and is done by making an incision a little above Poupart's ligament and pushing up the peritoneum as for the ligation of the external iliac artery. Through the wound thus made, the vagina is to be opened. If the incision of the peritoneum could be avoided, effusions of blood or of sanious or purulent matter in its cavity would not take place, and the patient be protected from the most efficient cause of death. This advantage is, unfortunately, so fully balanced by the difficulties of the operation, by the number of vessels wounded, and by the inflammations liable to follow the extensive separation of the peritoneum, that the method is now entirely abandoned.

Vaginal Cæsarean Operation.—This name is applied to the incisions which are sometimes made on the neck or other portion of the uterus that projects into the vagina. Having described the operation on page 698, we shall not repeat it here.

§ 2. POST-MORTEM CÆSAREAN OPERATION.

Whenever a physician is summoned to a pregnant woman soon after her death, he ought to perform it, after having carefully ascertained that the death is real; because the child's decease does not always precede that of the mother, and numerous instances are recorded where living children have been extracted ten or fifteen minutes, and even half an hour, after the woman died.

[M. Villeneuve (of Marseilles), in a paper published in 1862, reports a number of cases in which it was certain that the children had really survived. Thus four of them owed their lives to the performance of the operation immediately after the mothers had expired. Five others were extracted alive after remaining in the uterus from ten minutes to half an hour subsequent to the mother's death. After half an hour, the cases of success became very rare; but there were two after two hours had elapsed, one after two hours and a half, one after three hours, and one after four hours and a half. Although the operation is generally useless at a later moment, it ought nevertheless to be performed; because some cases, whose authenticity I cannot vouch for, would seem to prove that the child's life may remain intact for ten, fifteen, or even twenty-four hours.

As it is the object of the Cæsarean operation to save the child's life, it were useless to undertake it before it becomes viable, that is to say, before the end of the sixth month. The only effect of an operation performed before this time would be the satisfaction of some religious sentiment. It ought to be done as soon as possible, because a few minutes are generally sufficient to terminate the child's life. Very often, indeed, it succumbs before its mother, or at the same time with her; and the operator, after all his mental excitement, almost always finds his hopes fruitless. On this account, M. Depaul thinks that auscultation of the fœtal heart should precede a decision to perform the operation. If it still pulsates, proceed as rapidly as possible; but if auscultation gives negative results, the operation would be useless, says the Professor, and ought to be abstained from. It is true, that by following this advice the *post-mortem* Cæsarean operation would only be performed under very favorable circumstances; but then precious time is lost in the necessary investigations, and the child may, in fact, be living although the pulsations of its heart are not perceived; so that there is a danger of abstaining without being positively certain that the child is dead. It were much better, therefore, to decide more quickly than to incur the risk of extracting only a dead body from the cavity of the womb.

I would, however, except those cases in which the physician reaches the woman as she is about expiring, and discovers, first, the normal action of the fœtal heart, and its cessation a few minutes later. Here, the stethoscope has really been witness to the death of the child, and I think the operation ought then to be withheld.

Before operating, the physician should, by every possible means, assure himself that the woman is really dead; inasmuch as some cases have shown that this may be only apparent. It is always, therefore, a duty to make the incision of the abdominal and uterine walls with the same care as during life, and to empty the bladder beforehand. An assistant ought also to apply his hands upon the walls of the abdomen in order to press back the intestines and prevent their exit; without this precaution the operation would almost certainly be impeded by the annoyance they would give to the surgeon.]

Forcible Delivery post mortem.—Should the female die during parturition, he ought to examine the condition of the genital organs immediately; for notwithstanding the fact that the labor may have but recently commenced, these parts, from their diminished resistance after death, have occasionally permitted the delivery of the fœtus to be effected by the version or the forceps. In fact, this latter operation would be positively indicated if the child's head were low down in the excavation; because, in such cases, its extraction by the Cæsarean section would be rendered extremely difficult, if not impossible; for numerous recorded instances have fully tested the inefficiency of tractions made on the fœtal trunk through the abdominal incision.

[Some cases, within a few years past, have even shown that in the case of a pregnant woman deceased before labor commences, the cervix may be forcibly dilated, the hand passed into the womb, and the child turned and delivered. The fact is, that after death the muscular fibres relax, and what would have been impossible with a living woman becomes practicable on the dead body; still, this method can be expected to succeed in exceptional cases only, and even then through the use of much force and the loss of time.

Notwithstanding the undoubted advantage, says M. Perrin, which this mode of delivery possesses as respects the woman, and although exempt from the inconveniences inseparable from the Cæsarean operation, the two modes of effecting delivery admit of no comparison as regards the great object in view, the rescue of the child, whose life is compromised and about passing away in its mother's womb. The Cæsarean operation enjoys, doubtless, considerable preëminence by the facility and promptness of its execution, and because it spares the child, which does not incur from it the slightest risk; whilst in forcible delivery, the manipulation required to prepare the genital passages involves a loss of precious time, and the force applied to the child either by version or by the compression and traction of the forceps, may either actually kill it or extinguish the spark of life which remains. (Perrin. Report published in 1864.)]

CHAPTER X.

OF EMBRYOTOMY.

This name is applied to the operation by which the parts of the child are divided so as to admit of their successive extraction, when it is impossible to terminate the delivery in any other way. In some cases it consists of simple punctures or incisions made on the head, chest, or abdomen, with a view of diminishing its size, while in others the body of the child is divided into several parts.

It was elsewhere stated that, whenever a considerable quantity of water had accumulated in the head, chest, or belly, the fluid could easily be evacuated by a simple puncture with a straight bistoury, or still better by a trocar; and, therefore, we need not recur to the subject. (See *Hydrocephalus.*)

Embryotomy is indicated whenever there is any insurmountable obstacle to the spontaneous expulsion of the child, and where an application of the forceps proves insufficient to effect the delivery; always supposing that the fœtus is dead, or there are good reasons for believing that its viability is destroyed by the length of the labor. This operation is resorted to in England much oftener than in France; for most of the accoucheurs of that country proscribe the Cæsarean section and symphyseotomy, except in cases of absolute necessity, but they do not hesitate to mutilate the infant, even when it is still living; and the reader will have seen, from the foregoing chapters, that we fully embrace the same opinion.

[Embryotomy is not of recent addition to the obstetric art, for several passages exist in Hippocrates relating to it; but the process is undergoing constant improvement, and gradually assuming the character of a well-defined surgical operation. Embryotomy is performed in several ways, according to circumstances; sometimes being limited to simple perforation of the cranium, to which operation the name *craniotomy* is specially applied; sometimes the head is crushed by means of the cephalotribe, and the process is called *cephalotripsy;* finally, division of the neck, or of some portion of the trunk, may have to be performed. We shall, therefore, give an account, in three successive articles, of: 1st, Craniotomy; 2d, Cephalotripsy; 3d, Embryotomy by section of the neck or of the trunk of the child.

ARTICLE I.

CRANIOTOMY.

Under the name of *craniotomy* have often been classed all operations of embryotomy which are performed upon the head of the child; we prefer, however, to reserve this name for the simple perforation of the cranium, and shall, therefore, use it in this limited sense.

Numerous instruments have been invented for the perforation of the cranium, but we shall describe only those which are best adapted to the purpose, and which are the most generally employed. In the first place, however, we would mention the simple bistoury, which is in every surgeon's hands, at the same time remarking that it can rarely be used except when the head is very low down and the fontanelles and sutures are easily accessible. Its point would be almost sure to break upon the first attempt to penetrate the bone with it, and it would be very difficult to manage at the superior strait. A common knife may, indeed, be substituted for the bistoury, but it would still be a very imperfect instrument, and every one knows how acrimoniously Sacombe accused Baudelocque of having used it. The sharp point concealed in the end of one of the handles of the forceps[1] would answer the purpose better, and in the absence of a special instrument may even be found very serviceable.

FIG. 149.

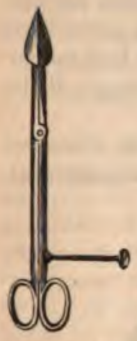


FIG. 150.

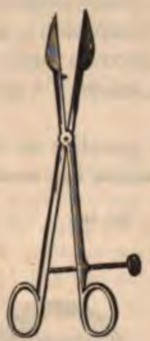
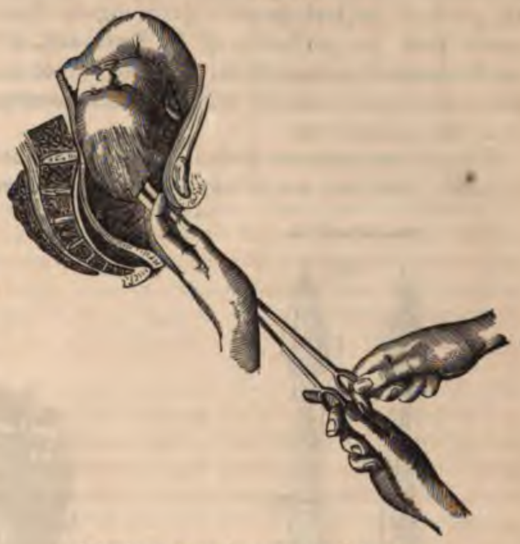


FIG. 149. Smellie's scissors closed.
FIG. 150. The same opened.

FIG. 151.



Mode of introducing and using Smellie's scissors.

Mauriceau sometimes used a hooked knife, with which he incised the head for the purpose of allowing the cerebral matter to escape, and sometimes an instrument shaped like a pike head, which was the original model of our best modern perforators. Dugès' terebellum is a sort of conical screw, with a deep thread sharpened at the edge, excepting the largest turn, which is left blunt, in order to protect the mother's parts. The inventor claims for it the double office of a perforator and a traction instrument by which the head may be drawn down.]

The instrument generally used is that known as *Smellie's scissors*, which is very strong, and has its cutting edges externally; and, being terminated by a sharp point, is admirably calculated for penetrating through the osseous vault; when, by opening the handles, the original orifice is easily enlarged.

M. Hippolyte Blot has latterly had a perforator constructed by M. Charrière, which, I think, is destined to supersede *Smellie's scissors*, generally made use of hitherto. It possesses all the advantages of the latter without its inconveniences

---

[1] Some of the French forceps are so constructed. (See article *Forceps.*)—*Translator.*

This craniotome is composed of two blades, which cover each other, so that when the instrument is closed, the blunt edge of one extends slightly beyond the cutting edge of the other, and reciprocally. (Fig. 152.)

Each free surface bears at its extremity A, a projection, which gives to the point of the instrument a quadrangular form (these projections are borrowed from the perforator of M. Marchand, of Charenton); a screw fixed on the internal surface of the movable branch D, enters a notch in the opposite branch, and limits its motion in one direction, whilst the spring C, limits it in the opposite one.

The two branches are articulated in a manner peculiar to M Charrière (*à tenon*), and they are to be opened when the cranium has been penetrated.

Figs. 152 and 153.

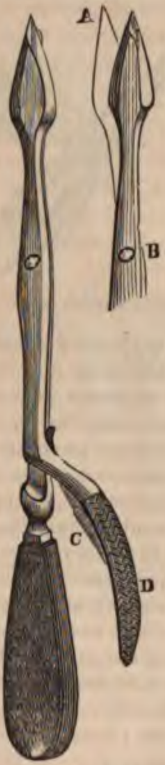


Fig. 152. Cephalotome closed.
Fig. 153. Cephalotome opened.

Fig. 154.

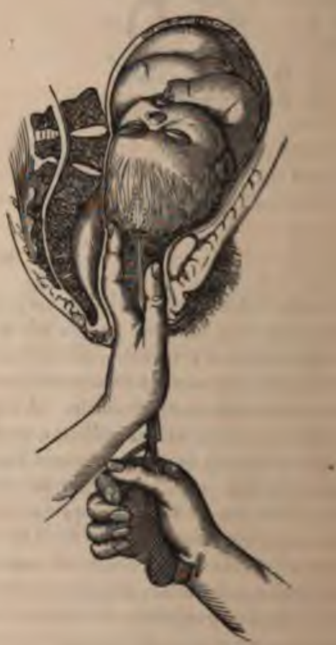


Fig. 154. Cephalotome incising the cranium.

Before withdrawing the craniotome, it is allowed to close itself, after which its extraction from the genital parts is unattended with danger either to the vaginal mucous membrane, or to the fingers of the operator.

The principal advantages of this instrument may be summed up as follows:

1. Great solidity and simplicity.
2. Introduction and withdrawal entirely safe, rendering it capable of being used by the least experienced operators.

3. Capability of acting by *pressure*, and that with a *single hand*, the other remaining at liberty to guide the instrument, keep it in its place, and know what becomes of it during the operation.

4. Power of perforating the bones with the least effort, and, consequently, with the least chance of slipping.

5. It is easily dismounted and cleaned.

6. Finally, simplicity of structure, rendering it a cheaper instrument than Smellie's scissors, provided with their sheath.

[The instrument commonly used in Germany for perforating the head, resembles a trephine whose crown is concealed in a tube which serves as a sheath. Kilian's perforator is a good specimen of this kind of trephine. The instrument is applied to the head of the child and held there firmly, whilst the revolution of the trepan carries it through the scalp and skull, a circular piece of which is removed. The resulting wound has the advantage of being regular, circular, free from spiculæ which might wound the vagina, and so open as to allow the cerebral matter to escape freely. The construction of the instrument is, however, complicated and its application difficult.

We prefer Blot's perforator to all others, and shall have it chiefly in view whilst describing the operation for piercing the cranium. After the woman is put in a convenient position, the operator introduces the fore and middle fingers of the left hand into the vagina, and passes them far through the uterine orifice, until they reach the head of the child, where he holds them as firmly as possible. The right hand then grasps the instrument by its handle, and slips the point along the fingers of the left hand, which serves as a guide, to the head of the child (Fig. 154). It is advised that a suture be sought for, or, preferably, a fontanelle, which would be more easily traversed than a bony plate; but, in most cases, it is not easy to follow the recommendation. On the other hand, the greatest care should be taken to apply the instrument directly to the child's head, and not to perforate the circumference of the mouth of the womb. The scalp offers very little resistance, though it should be borne in mind that it is often quite thick when an œdematous swelling happens to be hit upon. As soon as the point of the perforator comes in contact with the bones of the skull, it is to be rotated on its axis, at the same time making strong pressure through the handle, when, shortly, the sensation of resistance overcome, informs the operator that the instrument has passed through the bone.

Craniotomy is sometimes difficult on account of the mobility of the head, which recedes before the instrument. When this is the case, an assistant ought to make strong pressure with his hands on the hypogastric region, in order to fix the head upon the superior strait. It is important also to be aware that an inadvertent movement may cause the instrument to slip and wound the mother's parts. To avoid this slipping, the perforator ought to be guided as far as possible in the direction of the axis of the superior strait, perpendicularly to the part of the head to be opened, and, preferably, too far forward to too far behind. The handle is to be held firmly by the right hand, whilst the point, carefully supported by the two fingers of the left hand, is prevented from swerving in any direction, and from sliding between the scalp and the bones of the head. It could only be through singular and culpable negligence that the sacro-vertebral angle should be mistaken for the head, and the perforator be implanted upon it. Without anticipating an error of this kind, it would be well to effect the perforation at a point rather near to the pubis, inasmuch as, when the instrument is passed too far back, the point reaches the bones in an oblique direction, and slips more readily.

When the point of the perforator is within the cranium, the entire point of the lance is pushed in boldly; then the movable handle is to be depressed in order to separate the blades, which are next to be moved in every direction, so as to break up the brain throughout. This act facilitates the issue of the cerebral matter, and by destroying the fœtus instantaneously, spares the accoucheur the harrowing spectacle of a mutilated child still breathing at its birth.

In order to withdraw the instrument, the two blades are allowed to come together, and the lance-shaped head soon re-enters the opening which it made. If it be thought desirable to enlarge this opening, the movable handle is now again to be depressed, when the edge will cut widely through both the bone and the scalp. We ought to say, however, that it is rarely necessary to do this, and that almost always the instrument is withdrawn without enlarging the original puncture. The abstraction of the instrument is immediately followed by a discharge of blood and cerebral matter.

It is more difficult to perforate the cranium when the face presents, but the same rules are to be followed as in the preceding case; being careful, however, not to engage the perforator in the bones of the face, where it might get involved without reaching the cavity of the skull. When possible, the instrument should be passed through the forehead or directed into the orbit, which serves as a sure guide. If the lower part of the face only were accessible, and the mouth open, the palatine arch might be traversed and the cranium entered behind the nasal fossæ, as I once saw done by Professor Dubois. Lastly, in breech presentations, when the trunk is disengaged and the head retained by a contracted pelvis, perforation may be indicated; to accomplish which, it is usual to apply the instrument to the occiput or to one of the parietal bones.

Craniotomy has the advantage over almost all the other operations, of being practicable when the mouth of the womb is not fully dilated, for it may be undertaken when opened just sufficiently to allow the instrument to pass. Under these circumstances it would be impossible to apply the forceps or the cephalotribe. The advantage is here invaluable; for it is well known that, in cases of deformed pelvis, the orifice often dilates very slowly indeed.

As a single operation, craniotomy has much to recommend it. It allows the discharge of cerebral matter; the cranium, being emptied under the uterine contraction, is lessened in size and flattened, so that it sometimes passes the contracted part without requiring any further intervention. To facilitate the accomplishment of this result, after the perforation is made, water may be injected into the cavity of the skull, bringing away in its reflux the greater part of the cerebral substance. Although this injection was very customary formerly, it is now rarely done, because we have at hand powerful mechanical means of crushing the head, should that be deemed necessary.

Craniotomy is an extremely useful operation; of itself, it fulfils all the indications in a certain number of cases, provided we are willing to wait patiently until the head is emptied and moulded to the form of the contracted part. Often, however, it is, alone, insufficient, because the reduction of size of the cephalic extremity affects, for the most part, the vault of the cranium only; leaving its base, which is more thoroughly ossified and thicker, with its normal dimensions. We would also add, that the expulsion of the fœtus can be accomplished only when the contractions are powerful, and then after a long time. Under these circumstances, therefore, it often becomes necessary to extract the head, for which purpose the whole array of crotchets, tractors, and bone forceps have been devised.

Of all these latter instruments, the most dangerous was the crotchet, and its use has been very properly abandoned. It was sometimes fixed upon the external parts of the cranium, and sometimes carried within it through the opening made by the perforator. Its point was then directed to the part upon which it was desired to fix it, getting as near as possible to the base of the skull; the occipital bone, mastoid processes, the sphenoid and petrous portion of the temporal, giving it a sufficiently secure hold. Being satisfied that it was firmly attached, tractions were made in the direction of the pelvic axis; but notwithstanding every precaution, and the skill of the operator, the instrument would often slip and wound severely the maternal organs. It ought now, therefore, to be entirely laid aside.

Tractors and bone forceps are advantageously substituted by the cephalotribe, so that when craniotomy has been performed, cephalotripsy is had recourse to in the majority of cases, provided the mouth of the womb is sufficiently dilated to allow the operation to be performed.

ARTICLE II.

CEPHALOTRIPSY.

Cephalotripsy, also called *cephalothalsia*, is an operation having for its object the crushing of the head of the fœtus, in order to render it possible to extract it. Notwithstanding some scattered passages which show that the idea of crushing the fœtal head had been entertained long since, the operation is of recent date. The conception could indeed hardly have been realized until after the forceps had been invented, because by making the blades of this instrument stronger and closing its handles with power, the head may be reduced in size and even partly crushed; in fact, the forceps of Coutouly, Assalini, Delepech, and Lauverjat acted in this way. Nevertheless the forceps, even when its handles were approximated by means of a screw, could be nothing more than a very imperfect crushing instrument.

It was necessary, therefore, to contrive a special apparatus for the purpose, and this was done by A. Baudelocque, nephew of the celebrated accoucheur of the same name. He gave the first account of his instrument in 1829 and used it shortly afterwards successfully in the case of a woman whose pelvis was contracted to three inches in its antero-posterior diameter.]

The honor of its invention, notwithstanding several rival claims, is due to M. A. Baudelocque. It is composed of two long branches, the blades of

FIG. 155.

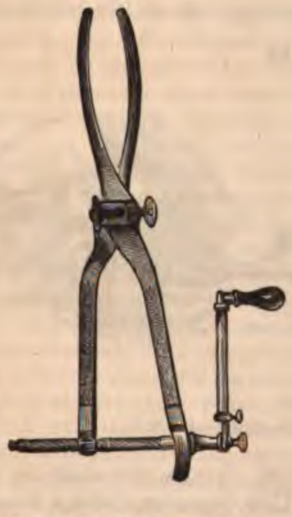
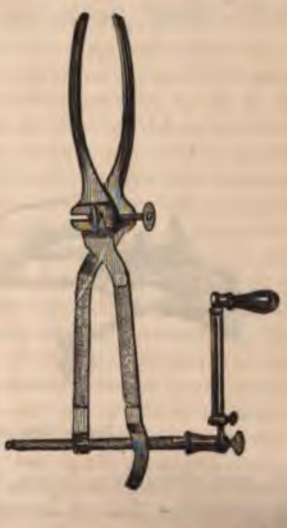


FIG. 156.



The embryotomy or cephalotribe forceps.

A comparison of these two figures will furnish an idea of the amount of separation obtained at th of the blades (Fig. 156), by means of the regulating screw.

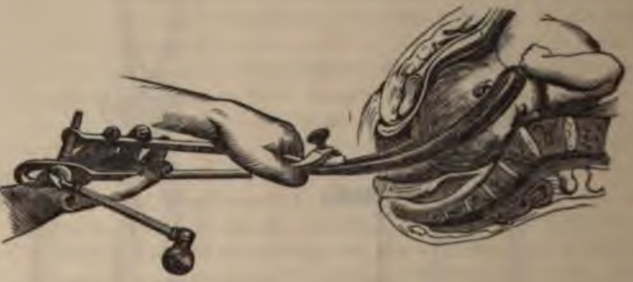
which are devoid of fenestra, and, besides, are far less curved than those of the ordinary forceps, so that, when closed, they can pass through a diameter not exceeding two inches. The two branches articulate with each other near the middle, and when they are joined, the blades can be tightened at pleasure, by means of a screw passing through the ends of the handles, and worked by a powerful lever.

Even as it is now constructed, Baudelocque's embryotomy forceps is certainly a very useful instrument; but as I have elsewhere proved (*Revue Médicale*, May, 1843), it presents some disadvantages which render its application difficult and often even dangerous. For instance: 1. It is too straight to accommodate itself to the curvature of the pelvis, and it is therefore applied with difficulty to the sides of the head. 2. As the clams are nearly plane, they open like a pair of scissors, and do not incase the head, as the concave blades of the ordinary forceps do; consequently, they are liable to slip, and thus give rise to serious accidents. 3. Tractions made by it are very often ineffectual, even when well applied to the head; because it necessarily draws in a direction different from the axis of the superior strait, owing to the absence of curvatures in the edges of its blades.

As the difficulties and dangers attending its use are not imaginary, I have endeavored to prevent them, by suggesting a modification in the embryotomy forceps generally employed, although well convinced that the failure of an operation is very frequently more dependent on the operator himself than on his instrument. With this view, I had an instrument made by M. Charrière, which differs in two important particulars from those hitherto constructed, and which seems to obviate the various disadvantages I have just enumerated.

We stated above that the absence of curvature in the edges interfered very seriously with the seizure of the head, which is found more anteriorly than in well-formed pelves, both in consequence of the pelvic contraction and its own elevation; hence, we have given a curvature to our forceps slightly exceeding that of Levret's. This, however, did not require a great effort of the imagination, for we have only impressed the same modification

Fig. 157.



The embryotomy forceps applied and locked.

of the embryotomy forceps that Smellie and Levret long since gave to the one invented by the Chamberlens. This curvature is intended to fulfil the indication of accommodating the shape of the instrument to that of the curved canal it has to traverse.

The slipping of the head during the tractions is principally owing to the fact, as averred above, that the blades, from being nearly plane on their internal surface, do not properly embrace this part, and that, opening like a pair of scissors, their widest separation is found at the points. Here the difficulty was considerably greater, because the internal surface of the clams could not be hollowed out without greatly increasing the interval at their middle part, and, consequently, without rendering the instrument inapplicable to a host of cases where Baudelocque's might be successfully used. After mature reflection, we propose the following as its second and most important modification: namely, to make a much wider entablature at the joint; while, in other respects, the length and width of our forceps correspond with Baudelocque's. This increased width at the articular part permits the base of the blades to be removed from each other laterally by means of a regulating screw, that can be turned at will; the point of which, by working on the pivot, will permit a greater separation at the base than at the points of the blades. Hence, it is evident that when the head is once embraced by the instrument, it cannot slip from the extremity of the clams during the tractions, because the interval is much less here than at the base or even than at their middle part. In a word, the embryotomy forceps hitherto employed resembles a cone when half opened, the base of which is at the points of the blades, and the apex at the articulation; but ours, on the contrary, may, under the same conditions, be compared to a cone having its base at the articular part, and its summit at the extremity of the blades.

[The handle at the end of Baudelocque's cephalotribe was powerful but awkward, besides requiring considerable time for the screwing up and unscrewing; sometimes, also, it struck against the limbs of the patient, so that on all these accounts it became desirable to substitute some better arrangement for it. In M. Chailly's instrument, the handle was replaced by a strap which wound around a metallic axle. Beside this improvement, its edges were sufficiently curved to correspond to the axis of the pelvis. In order to prevent slipping, the ends of the blades were bent in such a way that one overlapped the other, the included part being thus grasped in a manner which makes escape impossible.

Prof. Depaul's cephalotribe has at the ends of the blades two hooks, projecting slightly from the internal surface, which implant themselves in the head when the instrument is closed, and thus render slipping difficult. Instead of the crank for closing the blades, there is a Vaucanson chain stretched transversely from one handle to the other, which is put in motion by a key and pinion. The branches are kept together by means of a ratchet. The manner of working it is very simple: the instrument being applied, the chain is passed through the opening in the end of each handle; then the key is applied and turned until the blades are sufficiently approximated, after which the extraction is proceeded with. To detach the instrument, it is only necessary to raise the ratchet, when the chain instantly becomes free, and is removed very quickly.

M. H. Blot invented an instrument whose branches are brought together by means of a removable screw which may be attached at will on the end of the left handle, and then pushed through a bifurcation of the right handle. The handles are then approximated by a nut which traverses the screw.

In Locarelli's cephalotribe the handles are brought together by a screw which passes freely through an opening at the end of the right handle, and then enters a nut made in halves and hinged, placed at the end of the left handle. When it is wished to disconnect the instrument, the hinged nut is opened and the screw is immediately free. This instrument allows the two branches to be brought together and separated more rapidly than any other. The right branch of Locarelli's cephalotribe is, besides, very slightly curved, to allow of its application behind the pubis, the other branch being applied behind. The head of the child is thus compressed from before backward in the direction of the antero-posterior diameter, which is almost always contracted.

The cephalotribes most used in Germany are those of Hüter, Scanzoni, and Braun, whose chief peculiarity consists in the effecting of the compression by means of an endless screw between the branches of the instrument and parallel to it. The handles are embraced by a metallic ring, as may be seen on certain pincers used by mechanics, and the screw, by moving the ring up or down, separates or closes the handles as desired.

It is not our intention to treat here of every case to which cephalotripsy is applicable, whether the necessity for it depends upon the mother or upon the child; but we shall undertake to examine the consequences of the application of the cephalotribe upon the head of the fœtus. As a compressing and crushing instrument, the cephalotribe possesses considerable power; and there can be no doubt that the head is broken up by it with great ease, regardless of the direction in which it is seized; but whilst it is flattened in the direction of one of its diameters, the others are sensibly lengthened, which is a fact worthy of attention. The experiments of Hersent, who wrote a very interesting paper on this subject, show that all the diameters except the one included between the blades of the forceps are lengthened, on an average, about seven sixteenths of an inch, when the cephalotribe is applied, without the previous performance of craniotomy. In a second set of experiments the cephalotribe was used after opening the cranium, when the same increase of all the other diameters than the one seized was again observed; but in the latter case, the increase, instead of being seven sixteenths of an inch, did not average more than from one sixteenth to three sixteenths of an inch. These experiments will not be lost sight of when we come to consider whether it will be worth while or not first to perform craniotomy when the use of the cephalotribe is decided upon.

The crushing of the vault of the cranium only would not be sufficient in many cases of extremely contracted pelvis, and amongst the various objections made to cephalotripsy it has been questioned whether the base of the skull was ever really broken up by that operation. It is evident that the effects will vary according to the manner in which the head is seized, but we are able to assert that the base of the skull is often really broken up. There can be no doubt that this was the case with two heads upon which we ourselves performed the operation, and which are now in the obstetrical museum founded by Prof. Depaul at the hospital of the Clinique. We would add, that on more than one occasion we crushed not only the base of the skull, but even several of the first cervical vertebræ.

The compression and crushing of the head, although considerable, still have limits which it is well to be acquainted with before undertaking the operation. It is well known that deformities of the pelvis, in consequence of the absolute impediment which they present to the expulsion of the fœtus, afford the most positive as well as the most frequent indication for the performance of cephalotripsy; but it ought to be equally well known that beyond a certain point the contraction of the pelvis itself makes the operation difficult, or may even render it impossible. The foregoing considerations are the more opportune as the advantages and innocency of the cephalotribe forceps have been generally overrated in the acceptance of the inventor's claim that it might always be efficiently and easily applied, provided the sacro-pubic diameter would measure more than one inch and eleven-sixteenths of an inch in length. Hersent, on the other hand, as the result of his experiments on the dead body, fixed the extreme limit at two and a half inches, and when the contraction was greater than this, did not believe that cephalotripsy could be performed successfully unless the child was very imperfectly developed. Experience has proved this idea to be erroneous, and most accoucheurs unite in the belief that unless the child be very large, success may be looked for in a pelvis which measures no more than two inches in its antero-posterior diameter. Still it should be well understood that a contraction so great as this renders the manipulation of the instrument very troublesome, whilst the operation is long and difficult and the risk to the patient very great. Ought it therefore to be decided that under two inches cephalotripsy is so serious an undertaking that the Cæsarean operation should be preferred to it? Prof. Pajot protested against this opinion, and, undeterred by the difficulties, declares in a paper published in the *Archives Générales de Médecine*, that he considers cephalotripsy as proper not only in a pelvis of two inches, but even in one of one inch and one-eighth of an inch, and admits of no limit save that which renders impossible the introduction of the instrument.

But we ought to add that a favorable result under these circumstances would be impossible were it expected to extract the head between the blades of the forceps; M. Pajot, therefore, after crushing the skull, unlocks the instrument and withdraws the branches separately without making any traction, leaving it to the uterus to mould the head upon the contracted part and effect its expulsion.

M. Jacquemier had already examined this side of the question when he wrote as follows: "The agency of the cephalotribe forceps is rather one of compression than of extraction. In many cases, it is capable of crushing the head when it will be incapable of dragging it through the contraction. Still, under the latter circumstances it may prove of great service, and either attain or powerfully concur to the attainment of the end proposed. For when the instrument is withdrawn, the head is really supple, plastic, entirely reducible in every direction, which is a condition completely at variance with that which it has when still retained within the jaws of the closed instrument, a fact to which sufficient attention has not been paid. If left to the expulsive efforts of the womb, it may still be able to pass the obstacle after becoming moulded to the form of the pelvis; extended where the latter is larger, and flattened where it affords the least space."

The cephalotribe may be applied at once upon the head without previous perforation. The head is then crushed, and the cerebral matter is forced from the cavity of the cranium under the scalp, when the latter remains intact, or escapes altogether when it happens to tear. At other times the brain finds exit through the orbits, the nostrils, or the mouth. Baudelocque thought this kind of evacuation was all that was necessary, and even regarded the preservation of the integrity of the scalp as one of the advantages of his method. What we have said of Hersent's experiments shows that the reduction of the size of the head is greater when the cranium is perforated before the crushing; therefore craniotomy is now almost always performed before using the cephalotribe; and as it is certainly the preferable course, we do not hesitate to advise it. It is true that it has been charged with favoring the formation and projection of splinters of bone, whose points are liable to lacerate the maternal tissues; but are not these splinters as liable to be formed when the head is crushed without previous perforation? We have already witnessed a great number of cephalotripsies, and observed how very rarely this inconvenience occurred. The matter has made an undue impression, and the argument drawn from the production of spiculæ seems to us far more availing in theory than in practice. The fact is, that the wound made by the perforator is almost always included between the blades of the instrument, which shield the vagina whose walls they keep apart; so that if projecting points of bone were detected, nothing would be more easy than to remove them, either with the hand or strong pincers, before making any attempt at extraction.

Therefore, except under peculiar circumstances, the cranium should be perforated, after which cephalotripsy should be performed under the same conditions and with the same preparations as required by an application of the common forceps at the superior strait. The rules which should guide the surgeon in the introduction of the cephalotribe are precisely those prescribed for the forceps; therefore, the instrument should be warmed, greased, and each branch held and introduced like a branch of the forceps, in order to be placed on the sides of the superior strait without regard to the direction in which the head will be seized. In this application, however, difficulties must be expected to be met with, due to the faulty conformation of the pelvis; the blades are liable to be turned aside and are sometimes twisted around so as to bring the concave surface outside. Very often, long continued trials are required before they can be placed regularly in position. No force ought ever to be used, for, as the instrument is heavy and its end quite narrow, though rounded, the uterus might easily be torn by any sudden movement. The first branch is generally pretty easily applied; there is more trouble in finding a passage for the second, and it is sometimes necessary to withdraw the first branch, and invert the order of introduction. When the head is firmly pressed down upon the superior strait, a free space should be sought for through which to slip the end of the instrument. Generally, however, the head is movable and recedes before the blades, which fail to grasp it unless care be taken to hold the head motionless by an assistant, who does so by making strong pressure with his hands on the hypogastric region. At other times, the permanent contraction of the uterus upon the head occasions another kind of difficulty. To overcome them all, the best plan is to introduce as far as possible the hand which serves to guide the blade, and then, in order to avoid unnecessary suffering to the woman, the second blade can be slid along the same hand. This was Hatin's plan and is recommended by Chailly; we think it a good one in some cases, although we would not make it an ordinary rule.

The very first thing to be done is to grasp the head firmly and to crush its base if possible; but to effect this the instrument must be made to enter very deeply, lest a portion only of the head be seized and the crushing be imperfect. Almost all authors recommend, besides, that the handles of the cephalotribe be pressed very far back against the perineum, in order that the blades shall have a forward direction, because, as is well known, in deformed pelves the sacro-vertebral angle projects and presses the head toward and against the pubis. This counsel ought not, in my opinion, to be too strongly urged, for I think I have observed that when too closely followed, the vault only of the cranium has been crushed. I explain this failure by supposing that in most strongly marked cases of contracted pelvis the fœtus is often doubled up in such a way that the cranial vault corresponds with the anterior abdominal wall, whilst the base and neck look backward toward the sacro-vertebral angle. Therefore, in practising cephalotripsy, after having passed the blades in very deeply, I have no objection to their remaining near the promontory; in so doing I have often succeeded in crushing the base of the skull and first cervical vertebræ at the very first attempt. Still, it were not reasonable to lay down positive rules in regard to this point, because the fœtus is not always similarly situated in reference to the circumference of the pelvis.

The cephalotribe is locked in the same way as the forceps, and the same difficulties in doing it are liable to be met with. The crushing is next proceeded with by turning the handle, chain, strap, or screw, by which the arms of the instrument are brought together. This stage of the operation ought to be executed slowly and gradually, in order to force out the cerebral matter, without lacerating the scalp, and causing the projection of spiculæ of bone through the points of rupture. The operator knows that the head has been well seized and emptied of its contents as far as possible, by observing the free discharge of brain externally. The degree of approximation of the handles also indicates the amount of flattening of the skull, and he often hears, or what is still more significant, feels, the crepitation which declares the crushing of the bones. Difficulty is liable to occur from the mobility of the head, which evades the instrument by rising above it or escaping before or behind the blades. The head, unfortunately, slips easily from the grasp of the instrument on account of the narrowness of its blades and their being so slightly curved upon the flat; on this account, M. Chailly recommends that after perforation the excerebration be performed by a forceps which fits better the rounded form of the head than the cephalotribe; the latter instrument being only used upon an already flattened head. The plan, however, is objectionable on account of the greater number of manipulations required.

When the head is grasped at last, the cephalotribe is to be closed as far as possible before proceeding to extraction; slipping is indicated by the great facility with which the handles can be brought together or the instrument withdrawn; in which case there is nothing to be done but to make a new attempt after changing the direction of the blades.

When the head is crushed, which will be known by the degree of closure of the handles, which ought to be almost in contact, the state of the parts ought to be carefully ascertained, and if any spiculæ project remove them. A few tractions will next show whether the head is securely held, and if so, the delivery will be proceeded with by drawing gently. Here it must be remembered, that although the head is flattened between the two blades, its other diameters are lengthened; and as the cephalotribe is almost always applied to the two extremities of the transverse diameter, the elongation takes place from before backward, that is, from the pubis to the sacro-vertebral angle, making it almost impossible to bring the head down into the pelvis without changing its position. To do this, the instrument is gently turned round far enough to bring the lengthened diameter of the head into correspondence with the oblique diameter of the pelvis; but it would be better still to turn it further until it has gone one-fourth around upon its axis, since in this position the flattened part of the head corresponds with the sacro-pubic diameter, which is almost always short, and the lengthened diameter to the transverse one of the pelvis, which is generally wide enough to allow it to pass without difficulty.

In the majority of cases, moderate tractions only are required to bring the head into the excavation. It ought then to be again turned, so as to bring its long diameter in an antero-posterior direction, and the two blades are drawn out in correspondence with the two ischio-pubic rami. Should difficulty be encountered, a few trials will soon indicate the best direction to be given them.

If the head is very firmly grasped, its size lessens during the tractions, and it moulds itself, so to speak, upon the shape of the contracted part; but, unfortunately, the instrument is not always well applied, or the stricture is considerable, so that in spite of the utmost care the cephalotribe loses its hold and slips upon the head. The tractions ought then to cease at once; otherwise there would be danger of tearing the scalp, and the instrument should be unlocked and withdrawn. Under these circumstances the expulsion of the child might, it is true, be left to the efforts of nature, but we think it preferable to proceed at once to a second or even third application in order to crush the head completely. Therefore, the instrument ought to be reintroduced with all the precautions which we have given. Still greater care, indeed, should be used; the hand must be introduced very deeply in order to guide the blades, whose ends often come in contact with the inequalities of the head or foldings of the scalp produced by the first operation. It should be attempted, also, to seize the head in a new position in order to crush it, so to speak, in every direction. The unfortunate tendency of the instrument to get into the groove which it made the first time, is one of the greatest difficulties to be contended with. These successive crushings followed by tractions, constitute the usual method of performing cephalotripsy as we have almost always seen it done by Prof. Dubois, and is the one preferred by M. Chailly and described by him in his book.

It does not appear to us that moderate tractions, even though they may be kept up, are likely to be injurious; contusion of the parts being no more liable to occur than when the head is impelled by powerful contractions of the uterus. Spiculæ are not often formed, and if they should be, care will be taken to remove them. The plan of successive applications and tractions is, we think, a good one, and that which we prefer.

But what is to be done when several applications of the instrument have failed to remove the head? We think that it would be imprudent to repeat the attempts more than three or four times, and if unsuccessful, the woman should be allowed to rest for several hours. The operation, in fact, ought to be resumed as often as required, without being continued too long at a time. Whilst the patient is resting, the uterus contracts, the head adapts itself to the opening of the pelvis, and a subsequent attempt is often more successful than it would have been a few hours previously. This mode of proceeding was characteristic of M. Dubois' practice, and was, so to speak, the secret of his great success. Herein cephalotripsy is comparable to lithotrity, successive operations being less dangerous than long-continued efforts.

Cephalotripsy, as just described, has become an every-day practice. M. Pajot asserts that it is a good one, and of undoubted service in cases of moderate contraction; but, says he, in extreme cases, such as range from two and five-eighths inches to an inch and one-eighth, the operation is unanimously conceded to be extremely dangerous; so much so that it may be said, with considerable justice, to be quite as hazardous to the mother as the Cæsarean operation, and that without the compensation offered by the latter, of the possible and sometimes probable preservation of the life of the child. Below two and five-eighths inches, M. Pajot thinks it dangerous to make traction, and would have the operation repeated without it. As in cases of extreme contraction it is impossible to deliver the fœtus without mutilating it, perforation will be performed as soon as possible, in order to favor the dilatation of the orifice, and the cephalotribe will be applied as soon as the dilatation is sufficient to allow it to be introduced. M. Pajot describes his method of performing the operation as follows:—

"The first crushing having been executed with the necessary care, and the head being firmly held, I attempt, with great caution, to rotate the instrument so as to make the reduced dimensions of the head correspond with the contracted diameters of the pelvis. I try then very gently to turn it either to the right or left, as may be most easy, and if considerably resisted on either side, I abstain from any further effort. Formerly, I was more persevering, but experience has taught me that the womb almost universally succeeds, and often very shortly, in moulding the new form given to the head by crushing, to the shape of the canal, at the same time imparting to it the movement of rotation performed with such difficulty by the instrument, the effect of the contraction of the womb upon the entire bulk of the fœtus being to turn it more certainly and with less danger than the cephalotribe would do. When the head is crushed as much as it can be, I unscrew the instrument, unlock it, withdraw it gently, *without having exercised the least traction*, and immediately proceed to a second, and, if the case requires it, a third crushing *without any traction*. The woman is then put to bed, and a light broth prescribed for her. According to the state of the patient's pulse, the general appearance, her quiet or excitement, as also the weakness or strength of the contractions of the ciently secure hold. Being satisfied that it was firmly attached, tractions were made in the direction of the pelvic axis; but notwithstanding every precaution, and the skill of the operator, the instrument would often slip and wound severely the maternal organs. It ought now, therefore, to be entirely laid aside.

Tractors and bone forceps are advantageously substituted by the cephalotribe, so that when craniotomy has been performed, cephalotripsy is had recourse to in the majority of cases, provided the mouth of the womb is sufficiently dilated to allow the operation to be performed.

ARTICLE II.

CEPHALOTRIPSY.

Cephalotripsy, also called *cephalothalsia*, is an operation having for its object the crushing of the head of the fœtus, in order to render it possible to extract it. Notwithstanding some scattered passages which show that the idea of crushing the fœtal head had been entertained long since, the operation is of recent date. The conception could indeed hardly have been realized until after the forceps had been invented, because by making the blades of this instrument stronger and closing its handles with power, the head may be reduced in size and even partly crushed; in fact, the forceps of Coutouly, Assalini, Delepech, and Lauverjat acted in this way. Nevertheless the forceps, even when its handles were approximated by means of a screw, could be nothing more than a very imperfect crushing instrument.

It was necessary, therefore, to contrive a special apparatus for the purpose, and this was done by A. Baudelocque, nephew of the celebrated accoucheur of the same name. He gave the first account of his instrument in 1829 and used it shortly afterwards successfully in the case of a woman whose pelvis was contracted to three inches in its antero-posterior diameter.]

The honor of its invention, notwithstanding several rival claims, is due to M. A. Baudelocque. It is composed of two long branches, the blades of

Fig. 155.

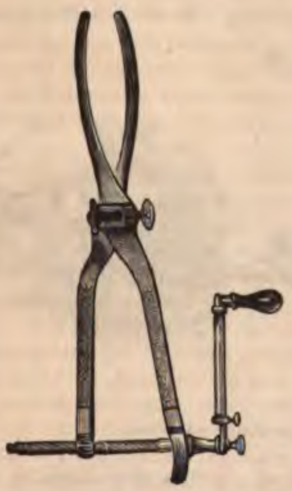
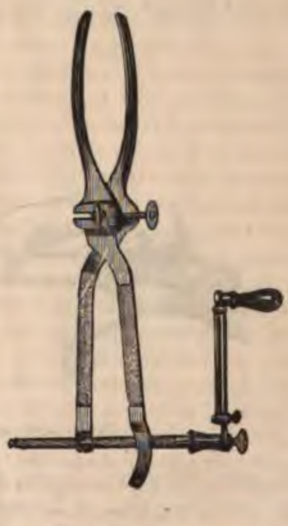


Fig. 156.



The embryotomy or cephalotribe forceps.

A comparison of these two figures will furnish an idea of the amount of separation obtained at the base of the blades (Fig. 156), by means of the regulating screw.

son that no one could possibly think of introducing them in front, unless the occiput should be behind, and the chin in relation with the symphysis pubis. Cases of retained head after detachment of the body will be treated of in the following article (see page 1058), and we have nothing special to add in this place to what is there said on the subject. The ordinary rules of cephalotripsy will be sufficient to guide the operator, but it will be more necessary than ever to fix the head by depressing the walls of the abdomen.

Numerous objections have been raised to the operation of cephalotripsy; thus, independently of the difficulties which attend it, and which we have pointed out, it is said that the length of time which it often demands, and the frequent manipulations, exhaust the women and render them liable to very severe inflammations, besides inflicting sometimes fatal traumatic lesions. It may be added, that some of the patients have recovered with vesico-vaginal fistulas. Can any better reply be made to these charges than that nobody denies the gravity of the operation, and to ask what better can be done? Such as it is, cephalotripsy is often and undeniably successful; Hemming, one of its latest detractors, himself publishes statistics which prove better than any argument, the services which it is capable of rendering, viz.: that out of 200 cases, there were 161 recoveries and 39 deaths.

Dr. William Jones gives, in his excellent thesis, the following results collected by him in the hospital of the Clinique at Paris, during the years 1857, 1858, and 1859.

In contractions of the pelvis above 3¾ inches, out of three cases of cephalotripsy, one was fatal.

From 3¾ inches to 3¼ inches, out of seven operations one fatal case.

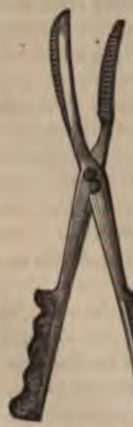
From 3¼ inches to 2⅝ inches, six cases, all recovered.

Below 2⅝ inches, eight cases, only three saved, and five deaths.

We thus have a total of 24 operations, giving 7 fatal cases and 17 recoveries. It is impossible to overlook the gravity of cephalotripsy in contractions below 2⅝ inches, inasmuch as for eight operations there were five deaths; whilst above 2⅝ inches, for sixteen operations, there were fourteen successful.

Cranioclasm.—Notwithstanding the advantages of cephalotripsy, the operation has, thus far, met with little favor in England, without any apparent good reason for so decided a repugnance in a country where craniotomy is so generally recognized. Besides the real objections already mentioned, the cephalotribe has been condemned on account of its considerable size, and its introduction into the genital parts made a subject of ridicule. This, however, being a poor argument, we hope that the prejudice will soon disappear; in fact, we think that we find an evidence of concession in the instrument devised and described by Simpson, under the name of the *Cranioclast.* (Fig. 158.)

FIG. 158.



The cranioclast, although much smaller than the cephalotribe, is, like it, intended to crush the bones of the head. It has two branches, which cross each other at the point of articulation; but the blades, instead of being curved, are almost straight; one of them, which we shall term the male blade, is solid and very thick, whilst the other, or female blade, is provided with an elongated fenestra which receives the male blade when the instrument is closed. A firm grasp is insured by the form of the wooden handles attached to it.

Although a more complete instrument, the cranioclast resembles such bone forceps as those of Mesnard, Stein, Boer, and Davis. It is used as follows. Craniotomy having been performed, the female blade is passed between the head and the pelvis, and the male blade pushed into the cranium through the perforation which was previously made. After locking the instrument, enough force is applied to the handles to crush the part seized, and to disjoint the bones by a twisting motion. Repeated applications to different parts of the circumference of the cranium are almost always requisite. To effect extraction, direct traction is sometimes all that is required, whilst at others it is necessary to turn the cranioclast several times upon its axis in order to roll the walls of the head, made soft and flexible by crushing, around the blades.

Simpson claims for his instrument the following advantages: The cranial bones to which the blades are applied are made soft and flexible, so that the contractions of the womb are often sufficient to expel the head. No bony fragment capable of wounding the genital parts projects beyond the scalp, which remains uninjured and completely protects the mother's organs. The size of the head is so far lessened as to become less difficult to extract than the trunk and shoulders. The crushing of the bones of the head always leaves sufficient hold for the instrument to prevent its slipping during extraction.

Unfortunately, experiments upon the dead body, and operations attempted upon the living by others than Simpson, have not proved so satisfactory. In the first place, it is not easy to apply the instrument, because of the absence of a curvature corresponding to the axis of the pelvis, and it is so short that the locking has to be effected in the vagina if the head is rather high up; now, under these circumstances, it is far from easy to effect the locking. The crushing is, besides, very imperfectly performed; although the bones are broken, they are rarely disconnected from their fellows, and still form with them a resisting structure; spiculæ of bone have also been known to perforate and project through the scalp. We shall extend our criticism no farther, having said enough to show that the cephalotribe has the advantage as a crushing instrument, leaving the cranioclast far behind in the comparison. We ought, however, to state that the latter instrument has really appeared to us to take a very firm hold of the bones of the head, a quality not to be despised when it is required to deliver a recently crushed head. In a certain operation rendered difficult by an extremely contracted pelvis, after having crushed the head in every direction, we were brought to a stand by the difficulty of extracting it, the cephalotribe having several times lost its hold. It became a question whether the expulsion should be left to the powers of nature, but before deciding to do so, the cranioclast was applied and the head delivered at the first attempt.

The Saw Forceps.—After making trial of the cephalotribe, Van Huevel found fault with it because it lengthened all the diameters except the one situated between the blades. He therefore concluded that it would be very difficult for the head to engage if it were above the superior strait, and if locked in the pelvis, the elongation of the diameters could hardly fail to bruise the soft parts of the lesser pelvis. He denied the possibility of being always able to rotate the instrument so as to bring the lengthened diameter to correspond with the normal diameter of the pelvis, observing, also, that the head can never be crushed from before backward; that is to say, in the direction of the usually contracted diameter. We have already disposed of these objections, which, nevertheless, induced M. Van Huevel to invent his saw forceps, which may be compared with the cephalotribe, although differing from it in its mode of action. With this new instrument he divides the head between the blades of a forceps, so as to enable him to withdraw the pieces separately without violence. The least traction detaches them, and they neither bruise nor wound the genital parts.

The saw forceps is composed: 1. Of an ordinary forceps, each blade of which bears internally two tubes flattened in opposite directions, and soldered together, the side of one against the surface of the other, so that their horizontal section represents an overturned ⊣. They are bent from without inward, like the forceps itself, but are set in a straight line from below upwards. The *internal* of the tubes, placed lengthwise of the blades, incloses a strip of steel which conducts the saw; the *external*, which is directed across the instrument, lodges the prolongation of the chain. They communicate by a large slit, which divides the internal and external walls of the former throughout its length, and the internal side only of the latter. The forceps articulates by entablature, with a movable pivot; upon the base of the latter turns a support perforated with a hole, in which is inserted a grooved key.

2. Of a clock chain, toothed as a saw in the middle of its length for the space of eight and a half inches, and provided with transverse handles, one of which can be unhooked. This chain passes through the upper opening of two steel strips, which are flexible above, and thicker and toothed below, and which, by entering the internal tubes, conduct the saw between the blades of the forceps.

3. Of a long key, with grooves and collar, like that of Heurteloup's instrument for crushing calculi, entering into the hole of the support upon the base of the articular pivot, and fitting into the teeth of the conducting strips. The extremity of the handle is split, and serves to turn the pivot of the forceps, as also for drawing out separately, with one of the two points, the strips from their sheaths.

Setting aside technical details, Van Huevel's instrument may be described as a forceps, each branch of which has on its inner face a gutter running from one end to the other, and of two strips of steel, both having an eye at one end through which a chain-saw passes (just like a thread with a needle at each end). After the forceps are applied, the two slips to which the chain-saw is attached are pushed into their respective grooves. The saw is thus brought into contact with the head, and embraces it to a greater or less extent, according to the distance to which the steel slips are pushed in. Motion is given to these slips by means of a grooved key, which fits into the teeth with which the slips are provided.

The mode of operating is described by Van Huevel as follows. The instrument should only be applied when the woman cannot be delivered either naturally, or with the assistance of the vectis, forceps, or by turning; the neck of the womb should also be dilated, and the membranes ruptured. Before operating, a bed should be prepared with a straw mattress, and a mattress folded double; bolsters, pillows, napkins, and bedclothes, make up this part of the provision. The woman lies upon her back, with the hips brought down to the edge of the mattress; the legs and thighs are flexed, and held apart by two aids, one on either side. The forceps are warmed slightly, and greased externally.

Suppose the head presents, no matter in what position. The operator takes his place before the woman, and inserts first on the left side of the pelvis, the male branch, introducing it as far as possible into the uterus, and one of the assistants holds it, whilst the other is passed in on the right side. When the forceps is articulated, a few tractions are made, in order to be certain that the head is well seized. The surgeon gives the handles of the instrument to the assistant on his right, whilst he surrounds it with a ligature. Then immersing the ends of the conducting blades, armed with the saw, in oil, he introduces both of them into their respective sheaths until they touch the head of the fœtus. He next passes the key beneath the left thigh of the patient, and engages the grooved end in the opening of the support; the assistant takes its handle in his right hand, and turns the key slowly on its axis, whilst the operator puts the saw in motion. Care should be taken to prevent the chain from twisting, and, as far as possible, to make the tractions in the direction of the guiding tubes. Unless the key is turned very slowly, the saw will be arrested by pressing too strongly upon the bones of the head. Should this occur, the assistant must reverse the motion of the key slightly, and afterward continue the manœuvre until the operation is completed.

When the section is finished, the key is taken out, and the handle of the chain unhooked, that it may be withdrawn; the conducting blades are also removed, and, finally, the branches of the instrument itself, after their disarticulation.

At this stage of the operation, if the woman is not exhausted, and expulsive pains make their appearance, the rest is left to nature, being careful to ascertain the disposition of the segments by the touch. A part of the brain escapes, the sawn edges override each other, the two portions of the cranium, especially the posterior one, become flattened, in consequence of their being traversed by flexible sutures, and the fœtus is eventually expelled. When, on the contrary, the woman's strength is exhausted, the detached portion of the head is seized with the abortion forceps or a pair of pincers, and therewith extracted. Should it happen that, in consequence of the blades of the forceps not having been introduced far enough into the pelvis, the division was not thoroughly effected, the adhesions should be broken up by means of twisting and other motions communicated by the pincers; as soon as the segment is detached, both it and the remaining parts will pass without difficulty.

However, should any trouble be experienced in extracting the fragments, there is no reason why another section, different from the first, should not be made, by giving another direction to the forceps. The already divided cranium can be depressed without difficulty, and therefore cannot prevent the diagonal application of the branches. This second operation leaves the skull divided into four unequal portions capable of being compressed in any direction, and extracted without difficulty.

It is not, however, always necessary to unlock the instrument in order to withdraw it, for after the head is sawn through, it is sometimes only necessary to make a few tractions with the instrument to cause a completely detached segment of the head to be delivered; occasionally, also, the entire head is withdrawn. If the resistance be greater, the instrument must be unlocked as mentioned.

The saw-forceps, though very often used in Belgium, has been rarely tried in France, and even then has failed in skilful hands. Dr. Verrier, however, defends it in his inaugural thesis, in which, after mentioning twenty-nine of Van Huevel's cases, twenty-three of which were successful, he reports fifteen cases derived from Drs. Simon, Marinus, and Wasseige. Eleven of the fifteen were entirely successful, two died in consequence of lesions existing previous to the entrance of the patients into the hospital, and two from peritonitis occasioned by the long duration of the labor. It is plain that these facts prove the saw-forceps to be a good instrument and comparable with the cephalotribe, though they do not prove it to be superior. To extend the comparison between the two instruments, it may be added, that the saw-forceps, like the cephalotribe, requires a certain field for action; its blades in their widest part measure one inch and five-eighths, and those operators who have used it most frequently do not venture to advise it in contractions below an inch and three-quarters.

A great objection to the saw-forceps is its great cost, its complexity and the minutiæ which have to be attended to during the operation. The movement of the chain-saw is not accomplished very easily, and it is liable to be jammed or broken. Another serious objection is, that it requires an experienced assistant: as the motion of the conducting blades should accord perfectly with that of the chain, it is necessary that both operators should act in unison. Finally, the greatest defect of all in the saw-forceps is its inefficiency as an extracting instrument and the frequent necessity for using bone forceps, in spite of all the objections to their employment. Nevertheless, there is cause for regret that the practical use of the instrument is not better known in France, as want of experience prevents our estimating its advantages or disadvantages at their just value. (Extracted from the *Traité d'Accouchement* of Lenoir, Sée, and Tarnier.)]

ARTICLE III.

SECTION OF THE NECK AND BODY.

We shall not describe decapitation performed after the body has be delivered, because, when it becomes necessary to perform it voluntarily, th process is as simple as possible, whether a scalpel or scissors be used for th purpose.

But this is not the only case in which the separated head is left behind i the uterus, for it will presently appear that a similar course is adopted i certain trunk presentations; or, the same thing may happen from ignorance or stupidity. In all cases the head has to be delivered, and its extraction is exceedingly painful when the pelvis is much deformed; for it then presents by its base, thereby rendering perforation more difficult. Under such circumstances, it has been recommended to attempt to turn the head, so as to bring some portion of the cranial vault to the superior strait, which of course should be done whenever possible. The excessive mobility of the head singularly favors the slipping of the perforator, and exposes the mother's parts to laceration. The best way of preventing this accident, is to direct an assistant to place both hands over the hypogastric region, and fix the head there by making considerable pressure at that point.

But the difficulty is not brought to an end by the perforation of the cranium, for even then the embryotomy forceps will often become necessary if the contraction is excessive; and, owing to the mobility of the part, its application is very imperfect, and it is likely to slip at the first tractive effort. The trouble in getting hold of the head is not merely dependent on its mobility, because, when the inclination of the superior strait is very great, it is situated above the pubis, and therefore cannot be reached by the instrument, which is necessarily directed posteriorly, in consequence of its moderate curvature.

It was to this that I attributed the failure of the attempts made on one occasion by M. Paul Dubois, at the Maternité. The Professor, being worn out by several hours of fruitless manipulations, had the kindness to permit my assistance. I introduced the right hand, and got hold of the lower jaw, which I attempted to draw down, but without any better success, as the base of the cranium was arrested by the symphysis. I found that the failure of my tractions was owing to the fact of their being directed too far downwards and forwards. I then substituted a blunt hook for the finger, and fixed it on the lower jaw, when, by depressing the handle of the instrument posteriorly, so as to make it operate downwards and backwards, I was soon fortunate enough to get the head into the excavation, from which it was readily delivered afterwards.

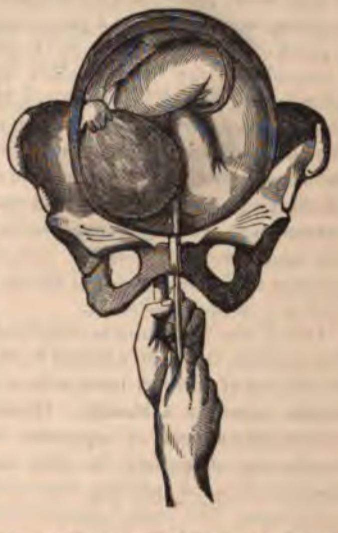
Most of the difficulties met with in this case might certainly have been prevented, by using the instrument just described, invented by myself.

Division of the neck or body is generally performed within the genital passages, the operation being sometimes the only means by which the operator can prepare the way for delivery in body presentations.

Version, in fact, is not always practicable in trunk presentations; for instance, where the membranes have been ruptured, and the waters discharged for some time, and the shoulder is low down in the excavation, the forcible contraction of the uterus may render introduction of the hand and version of the fœtus absolutely impossible. In such a case, we have nothing to do but to wait for spontaneous evolution, if the child is living; but as soon as it is dead, we must promptly relieve the mother from the dangerous consequences of a prolonged labor.

To amputate the arm under such circumstances is altogether useless, because its presence cannot incommode the operator; and, besides, it may afterwards prove very serviceable by favoring the tractions; it is on the body we have to act, and of the various plans suggested for the purpose, those described by Celsus and Dr. Lee are the only ones that appear practicable. In cases of this kind, Celsus had recourse to decapitation; and I have known this plan to be employed by M. Dubois on several different occasions. He acts in the following manner: Having ascertained the exact situation of the child's neck, he introduces the whole hand into the uterus (the left one when the head is at the right side, and the right one when it is at the left), and, hooking the index finger over the cervical region, he endeavors to draw it downwards, so as to make this part more accessible; should the finger not prove sufficient, the blunt hook is advantageously substituted for the same purpose (see Fig. 159). A pair of long scissors, having thick and very sharp blades, and moderately curved on the side, so as to correspond with the axis of the pelvis, is then guided up to the infant's neck along the palmar surface of the hand previously introduced; then the blades are opened a little, and a small portion of the neck is cut, then a second, and thus, by repeated small incisions, its whole extent is gradually divided. When the decapitation is completed, he draws on the arm which is usually found in the vagina, in this way extracting the trunk without much difficulty; and afterwards he delivers the head in the manner above stated.

Fig. 159.



Mode of using the blunt hook in the trunk presentations, to bring down the neck.

The decapitation is not always feasible, at least we could not succeed in effecting the section in a case to which we were called by Dr. Leveillé. The head and neck were so high, and the uterus so strongly contracted, that it was not possible to get the hand and scissors far enough up to embrace the neck properly; after several fruitless attempts, we determined to perform the operation recommended by Doctor Lee, but, before doing so, concluded to try the pelvic version. The right hand was passed in as far as the breech, but it could not reach the feet; the forefinger, curved like a hook, grasped the buttocks, and whilst this hand was pulling on the breech, the side of the fœtus, which had already engaged in the excavation, was pushed upwards and to the right by the fingers of the other hand. By operating in this manner for five or six minutes we were fortunate enough to bring down the pelvic extremity, and thus terminate the labor favorably as regards the mother. The lying-in presented nothing unusual.

[Decapitation only, is capable of fulfilling all the indications when, in a case of presentation of the body, it is impossible to turn. It has been objected to on account of the difficulty of performing it, and various instruments have been devised with the view of making it easier. A small knife shaped like a pruning-hook, fixed in a long and strong handle, may be used; or else a special instrument recommended by M. A. Baudelocque. Ramsbotham, Sen., also invented a sort of blunt hook with a concealed blade in its concavity, which, after the instrument is applied to the neck, becomes detached and severs it like a guillotine.

Van der Ecken proposed cutting through the neck with a chain-saw. For my own part, I had made by Charrière a blunt hook, in imitation of Belloc's sound. After the hook is applied, the spring passes through it behind the neck and comes out at the vulva. A cord is then attached to it which will include the neck when the hook and spring are withdrawn. My idea was to use the thread for the purpose of drawing through the chain of a linear écraseur, by which to effect the division of the neck. The only difficulty would be found in the passing of the spring around the neck, but I am so well satisfied that it would often be impracticable, that I believe the plan could be adopted in a few special cases only. Prof. Pajot devised a blunt hook containing a groove and tipped with a leaden ball, to which is attached a piece of whipcord lying in the groove. The hook being introduced, the cord is loosened and the leaden ball is supposed to drag it by its weight into the vagina, after having passed behind the child. To effect the division, M. Pajot proposes using the cord as a saw by grasping the ends and drawing alternately upon one end and the other with a rapid motion. The thread is passed through a wooden speculum in order to protect the vagina. It must be confessed that it is a rather curious way of effecting an operation of the kind, yet the possibility of doing it cannot be denied, inasmuch as it has been repeatedly accomplished by M. Pajot on the dead body in the presence of his pupils. The difficulty, however, does not lie here, but in the passage of the ball, which, I think, would be found no easier than in the case of the spring just now spoken of.

Of all the instruments contrived for the purpose, that of M. Jacquemier is, in my opinion, the best adapted to the object in view, and the most readily applied. It consists of a blunt hook with a wooden handle. The hook is included for its whole extent in a sheath. Hook and handle are constructed with a groove, in which slide a series of connected blades which are put in motion by raising and depressing alternately the little handle to which they are attached through the medium of a rod running the entire length of the hook. M. Jacquemier operates as follows: The hook inserted with its sheath being passed around the neck, he introduces the blades into the grooves and pushes them on by means of the handle until they project from the concavity of the hook. A to-and-fro motion then being communicated by the little handle, soon divides the soft parts down to the spinal column. The operator now withdraws the blades and substitutes for them a saw of the same size. With it, the bones are cut through without trouble, and it is withdrawn in order to complete the section of the soft parts with the cutting blades, which are again placed in the instrument for the purpose. Both the instrument and its manipulation are, as is seen, somewhat complicated, but it performs well on the dead body, and doubtless would be serviceable in practice. (See the drawing of this instrument in *Atlas* by Lenoir, Sée, and Tarnier.)]

Dr. Lee's method consists in separating the arm from the body, as also in perforating the thorax and abdomen; then, by fixing the blunt hook on the pelvis or lower part of the spine, he makes use of sufficient force to bring the child down double, and thus effects its delivery by a mechanism very similar to the spontaneous evolution. Perhaps it would be better to follow Davis's plan, and divide the trunk in two, and afterwards extract the parts separately.[1] This method should never be resorted to except when the section of the neck is impossible.

In a case in which version could not be effected, M. Parmat resorted to a process somewhat resembling that of Dr. Lee's, except that he did not first amputate the arm, this very properly seeming to him an altogether useless preliminary. Making use of the blunt hook which terminates the handle of the forceps, he passed it beyond the false ribs, and then turning it forcibly, so as to bring its extremity in contact with the integuments of the fœtus, he perforated with it the walls of the abdomen, if unable to reach the ribs, so that in withdrawing it, it hooked into the lower border of the thoracic parietes.

Then, by means of tractions with the branch of the forceps, he succeeded in communicating to the trunk a motion similar to that which it performs in spontaneous evolution. The head and shoulder ascended gradually, whilst the pelvis approached the vulva and was finally delivered.

This quite simple method is certainly preferable to Dr. Lee's, and in many cases might be substituted for the decapitation of the fœtus.

[1] M. Payan, of Aix, resorted to Davis's operation in one instance, where the trunk was low down in the excavation: but the plan certainly did not originate with him. (*Gaz. Méd.*, p. 521, 1840.)

PART VIII.

OF THE HYGIENE OF CHILDREN FROM BIRTH TO THE PERIOD OF WEANING.

HAVING carefully detailed the services to be rendered by the accoucheur to the child immediately after its birth, we have now, in order to complete the study of subjects which must subsequently claim his attention, to treat of the physical education of children. As the full details into which we have entered have already brought the work up to a considerable size, we are obliged to curtail greatly what we had proposed saying in regard to the hygiene of early childhood. The old and classic division of Hallé might be advantageously applied in this place, so that, if space allowed, we would treat successively of the *ingesta, applicata, percepta*, &c., &c. But, inasmuch as we are obliged to limit ourselves to a somewhat detailed account of alimentation, we shall treat of the other parts of infantile hygiene in a general way only.

Although the existence of the new-born child is generally styled independent, its physiological connection with the mother is not entirely severed by the delivery. It does not immediately cease to derive nourishment from the maternal organism; for although no longer connected with the uterus, nature has prepared another organ for the elaboration of the fluid designed for its future support. This fluid is the milk. The function by which it is secreted is called *lactation*, and the mode in which it is taken by the new-born child is termed *suckling*.

CHAPTER I.

LACTATION.

As stated whilst treating of the phenomena of pregnancy, the breasts begin to enlarge from the first month of gestation. Their active vitality, under these circumstances, soon gives rise to the secretion of a sero-lactescent fluid, which becomes more abundant as the term of gestation draws near. To this fluid, which is viscid and yellowish, the name of *colostrum* is applied. Under the microscope, it presents the appearance of globules, much smaller than the ordinary milk globules, united together by a viscid matter. Some irregular milk globules are scattered amongst them. Peculiar bodies (granular corpuscles), more or less globular in form, yellowish, and varying from ·003 to ·019 inches in diameter, are also observed.

M. Donné asserts, that there is an almost constant relation between the composition of this fluid secreted during pregnancy, and that which will be exhibited by the milk after delivery; in other words, the examination of the *colostrum* and its principal characters will enable us to judge of the probable abundance and quality of the milk. In reference to this, M. Donné divides women into three classes: 1. If the amount of *colostrum* secreted is so small that barely a drop can be obtained by the best directed pressure, if it contains but very few minute, imperfectly formed milk globules, and a very limited number of granular corpuscles, the milk will almost certainly be scanty, poor, and insufficient for the nourishment of the child. 2. If the woman secrete an abundant, but fluid, watery, and easy-flowing colostrum, resembling a thin solution of gum-arabic,—if it no longer presents striæ of a thick, yellow, and viscid matter, and if it be poor in milk globules and granular corpuscles, she may have a greater or less amount of milk, but it will be poor, watery, and unsubstantial. 3. Lastly, when the colostrum is obtained readily and in abundance, when it contains a more or less thick yellow matter, and resembles somewhat the rest of the fluid as regards consistency and color; when the microscope shows it to be rich in milk globules, well formed, and of good size, and containing granular corpuscles in greater or less amount, we may be almost certain that the woman's milk will be both rich and abundant.

This examination may be made with especial prospect of advantage about the eighth month. . . . . . It is well, however, to be aware that certain accidental causes, such as cold, or moral affections, may occasion a momentary discordance with the results of experience (Donné).

For the first days following the delivery, and until after the milk-fever, the fluid secreted by the mammæ retains the properties of colostrum, but is more abundant than during pregnancy. When the milk-fever comes on, the milk globules begin to present a more definitely rounded contour, and are more regular. Some histologists assert that the granular corpuscles disappear about the ninth day; but M. Godez states, that he has often met with them after the fifteenth day, and even after the twentieth, though only in the milk of moderately good nurses. They generally become more rare as a longer time elapses from the period of the milk-fever, and they disappear the more quickly, or, in other words, the milk is sooner formed when its quality is good and the woman in a satisfactory condition. The fact of their remaining after the first fortnight is an indication of an indifferent nurse.

After the milk-fever is over, the mammary secretion generally tends more and more to assume the characters of true milk. The latter is a white, opaque fluid, of a sweet, sugary, and very pleasant taste. Of all the fluids of the economy, it approaches the nearest to the blood in composition, and like it, separates into two parts upon standing. One of these parts is solid and the other fluid. The solid part, which is held in suspension, is formed of globules of fat or butter; the other holds in solution a special, azotized, and coagulable animal matter (caseine), sugar of milk, salts, and a little yellow matter.

These several parts, says M. Donné, when mingled together, are not distinguishable by the naked eye; but if a drop of milk be spread out upon a plate of glass, and examined through a microscope magnifying two hundred diameters, a multitude of rounded, transparent granules, brilliant as little pearls, will be discovered swimming in a limpid fluid. These small granules, which are rather less than ·0003 inches in diameter, are the milk globules, and are formed of a fatty matter or butter. In pure and unmixed milk, nothing besides these small globules is visible, and this purity of the milk is a certain indication of its good quality.

The amount of globules is liable to variation, their greater or less abundance representing with considerable precision the richness or poverty of the milk; that is to say, the more of these globules the milk contains, the richer and more substantial is it, the caseine and sugar being themselves in proportion to the amount of milk globules which represent the fatty matter or butter.

Not only does the milk vary in richness in different individuals, but it varies greatly in the same woman according to the time when drawn, her state of health or of disease, and the hygienic conditions in which she is situated. We shall hereafter have to study these variations when endeavoring to judge of the characters by which to determine whether a woman is or is not a good nurse.

The lacteal secretion is, as we have said, intimately connected with the function of generation; still it must not be supposed that it can only take place in pregnant or recently delivered females. It has several times been known to occur in consequence of frequent excitation of the nipple. Thus Belloc relates, that a domestic who was obliged to sleep in the same chamber with a recently weaned child, being annoyed by its cries, took it into her head to put it to her own breast. In a very short time she had milk enough to satisfy its appetite. Mrs. B——, says George Semple, mother of nine children, the youngest of whom was thirteen years old, lost her daughter-in-law a year before, she having died four days after her delivery. After her death she took charge of the infant, which was thin and puny, besides being so complaining and hard to pacify that after passing several sleepless nights, she allowed it to take her breast. Not more than from thirty to thirty-six hours had elapsed, before Mrs. B. was astonished to find her breast become painful and enlarged, and immediately afterward the secretion of milk was established as freely as had been customary after her confinements. For an entire year, the child nursed at the same breast which had given suck to its father twenty-four years before. Baudelocque mentions a little girl eight years of age who presented the same peculiarity; and the following case is related by M. Audebert:

Angeline Chauffaille, sixty-two years of age, and who had not had children for twenty-seven years, undertook to nurse her granddaughter artificially. From time to time, in order to amuse it, she presented it with her nipple; but what was her surprise when she suddenly found both her breasts full of an apparently good, healthy, and nutritive milk! She continued to nurse it for a year, and the secretion had not entirely ceased after the child had been weaned two months. At this juncture, her daughter again became a mother; her milk dried up, and the grandmother was able to nurse the second child. (Audebert, *Gaz. Méd.*, p. 250, 1841.)

The *duration of lactation* varies greatly even in women who do not suckle.

In some, it lasts several months in spite of all that can be done to put an end to it. I have just delivered, for the third time, a young lady who had an abundance of milk, after her first two confinements, for the space of three months, and this although her courses returned in six weeks. The secretion of milk in nurses sometimes lasts long enough to enable them to suckle two and three children successively. A lady in every way worthy to be believed, says Desormeaux, assured me that she had known a woman to suckle five children consecutively, which must have involved a lactation of at least six years' continuance. I find among my notes the following case, the origin of which I am, unfortunately, unable to discover: A woman had so abundant a secretion of milk for the forty-seven years succeeding the birth of her first child, that she was not only able to nurse six of her own children, but seven others also. She always menstruated regularly during the lactation, and at eighty-one years of age her breasts still yielded a small quantity of milk. On the other hand, the lacteal secretion often begins abundantly, then declines, and ceases without our being able to discover the cause. Many gradations are observable between these extremes, but the average duration of lactation in women is from twelve to eighteen months.

The *quantity of milk* varies still more than the duration of the secretion, even when no account is taken of the hygienic and moral influences, which have an undoubted influence over it. One woman, in other respects healthy, may barely be able to supply the amount required for the nourishment of a single child, whilst another may be able to suckle several at a time. Haller says that women have been known to furnish in a single day a pound and a half, or even two, three, or four pints of milk; in one case, the woman gave three pounds more than was required for her child. Unfortunately, it is difficult to know beforehand what the quantity of milk will be. The results obtained by M. Donné may, indeed, enable us to form a probable diagnosis, but are far from being certain. Even when the flow of milk is well established, as in the case of a nurse for example, it is very difficult to say what will be its amount. The nurse's age, and the size and form of the breasts, are doubtless matters of importance, but still insufficient. Generally, when nurses are too young, as under eighteen or twenty years of age, or too old, as over forty years, they give a less amount of milk. Finally, it would seem that in certain women the amount of milk increases with the birth of every child, inasmuch as they have it in much greater quantity after the second or third confinement than after the first. Women of a lymphatic temperament, also, have less milk than others.

Is the quantity of milk affected by the kind and amount of food? Although such is not proved to be the case in the human species, the fact is too well established as regards the females of the superior animals, not to lead to the same conclusion as respects women. For my own part, I knew a nurse whose flow of milk was sensibly increased after several times partaking of ground lentils.

The quality of the milk may be sensibly affected by numerous circumstances which have next to claim attention.

A. The *health of the nurse* is a matter of the highest importance. Chemical analysis shows that in diseases of any kind the proportion of solid constituents increases at the same time that the proportion of water decreases. According to the analyses of MM. Becquerel and Vernois, this fact is more observable in chronic diseases than in acute febrile affections. Now, as M. Bouchut judiciously observes, this increase in the proportion of the solid principles of the milk is an unfortunate alteration, causing the child to be frequently affected with indigestion and consecutive enteritis. The milk of women suffering from chronic diseases, phthisis for example, exhibits great alteration of the milk globules. Every one knows that when an acute affection appears in a recently delivered female, the breasts are scarcely swollen whilst the disease lasts, and even after recovery the lacteal secretion is sometimes but imperfectly established. A slight and evanescent affection during lactation appears to have but little influence, which is far from being the case when it is more severe and prolonged. The secretion sometimes ceases, and even when it continues without presenting any appreciable alteration to our means of investigation, the state of the child, which is observed to become rapidly emaciated, and to digest badly, indicates an alteration of the milk as certainly as the best chemical reagent. An inflammation, an acute irritation of an important organ, or a considerable discharge of some kind, lessens it, or even stops it altogether. The diseases of the breast, the inflammatory engorgements, phlegmons, and glandular abscesses, merit especial attention, not only because they diminish the secretion of the diseased organ considerably, but because they communicate dangerous properties to the milk. Nothing more than a simple engorgement is needed to produce a reformation of the granular corpuscles and a viscid condition of the milk; and should an abscess be formed, the microscope shows its presence even before the exploration of the breast distinguishes the collection of pus, by exhibiting the characteristic globules of that fluid with their granular appearance, their opacity, and the property of being completely dissolved in alkalies and of resisting the action of ether.

B. *Moral affections,* such as fright, anger, disappointment, &c., undoubtedly have a very great influence upon the quantity and quality of the milk. Often have I been astonished, after choosing nurses with abundance of milk, to find the secretion cease a few days after having given up their own child for a strange nursling; and several, whom I had discharged simply because they had no more milk, returned a few days after in excellent condition. Sorrow, at being removed from their country and separated from all that are dear to them, especially the relinquishing of their children, may often account for this momentary suppression. A violent emotion is often found to occasion an engorgement of the breasts, or else their sudden subsiding. Children are often rendered sleepless, and affected with colic and diarrhœa, sometimes even with convulsions, in consequence of violent anger of the mother. A nurse in the Hospital Cochin was very irascible, and indulged in high discussions with her neighbor. On one occasion she was more angry than usual, and her child had violent convulsions on the morrow. She left the hospital, but returned again some months after. Similar scenes were again enacted, and followed by the same effects as regarded the nursling. This woman had already lost her first two children by convulsions.

c. *Influence of the Genital Functions.*—1. *Menstruation.* Most women cease to be regular whilst they are nursing. Others have their courses to appear after four, five, or six months, and some again menstruate as regularly and freely as usual. Various opinions are held respecting the influence of menstruation upon the lacteal secretion, and the diversity is certainly due to the fact that this influence varies greatly in different individuals. There can be no doubt that, whilst it is slight in some cases, it is very decided in others. In endeavoring to judge of it, much greater regard must be had to the state of the health of the child, than to the microscopic or chemical examination of the milk. Some authors have manifestly been led into error by asserting that the appearance of the courses was a matter of indifference, for there are certain alterations of the milk which escape the closest examination, but which are nevertheless indicated by the effect which they produce upon the health of the child.

The milk of animals is very different in the rutting season from what it is at other periods; and this fact should have led to an anticipation of what takes place in women, whose menstrual epochs have the strongest analogy with the period of heat. The following points are proved by experience in relation to nurses who have their courses: Some, in consequence of the uterine discharge in connection with that from the breasts, fall into a state of debility and marasmus; some have their milk to diminish in quantity, and to become more serous; the child too emaciates, although their general health does not appear to be sensibly affected. Under either of these circumstances, the rarest of all, it is true, the mother ought to relinquish nursing. The milk of some women does not appear to be altered, nor the nutrition of the child to suffer, except during the flow of the menses; in which case, the mother's deficiency may be temporarily supplied by the use of cow's milk diluted. Finally, in many cases, the children's health is in no wise disordered, either during or after the menstrual period.

There are certain substances whose excess in the blood is necessary to the nutrition of the child, phosphate of lime for example, which are in great part eliminated by the menses; nor were it, perhaps, unreasonable to trace some relation of causality between the rachitis of children and the regular occurrence of the menses during the greater part of lactation.

A fact mentioned by Godey would seem to prove that, contrary to what is generally observed, the mammary secretion may be excited by menstruation. A woman, thirty-two years of age, entered the Lourcine Hospital to be treated for uterine hemorrhage. At twenty-five years of age she was suckling her own child, but took another one to nurse at the same time. Her business soon obliged her to give up this double nursing, and the secretion of milk ceased without any functional disturbance; a month after, her courses reappeared, and with them a slight swelling of the breasts, which discharged a small quantity of milk. At each succeeding period, the lacteal secretion appeared in greater abundance, and after some months became so great that the painful distention of the mammæ obliged her to have them drawn by another woman, as also to use pumps to assist in their disengorgement. Each menstrual return since then has always been accompanied by a secretion of milk, though in much smaller quantity, which coincided remarkably with the uterine hemorrhages for which she had been treated eighteen months previously, and for which she of late entered the hospital.

2. The supervention of *pregnancy* during lactation is almost always an unfortunate circumstance. It is very rare for the quantity of milk not to be considerably diminished, or at least to lose a great part of its nutritive qualities. The child almost always wastes away in consequence, nor, for my own part, have I ever known a single woman whose child did not suffer from it. I have several times been consulted by young mothers, whose children, put out to nurse at several leagues distance from Paris, were sensibly emaciated; and I have always been able to determine, or at least elicit an acknowledgment, that the subsidence of the breasts were occasioned by pregnancy. I, therefore, do not hesitate to regard pregnancy as incompatible with proper nursing. It is true that cases are recorded of women who did not leave off nursing throughout the entire duration of a new pregnancy, and who even, like the one mentioned by Van Swieten, gave the breast to a child of a year old during the early pains of labor; still, these cases are so exceptional as not to invalidate the general rule which we have laid down; and besides, it is not stated whether the woman who acted thus and had fine children, suckled them exclusively, without frequently administering in addition cow's milk and often soups or broths.

3. *Sexual intercourse*, of itself, I should regard as of little danger, unless it should be repeated too frequently, or with too much ardor; in which case it might act like any strong moral affection. It might doubtless result in pregnancy, which should be avoided, and on that account is interdicted to mercenary nurses. The case is much more difficult for women who nurse their own children. For, on the one hand, there are certain constitutions which might suffer from a complete abstinence, and, on the other, there are certain conjugal exigencies which it is impossible not to satisfy. Only great prudence and reserve should, therefore, be recommended.

D. *Effect of certain Alimentary or Medicinal Substances.*—A multitude of daily observations show that the smell, taste, and even the color of certain substances may be communicated to the milk: this is the case with garlic, beets, turnips, the bitter taste of wormwood, and the peculiar coloring-matter of madder and saffron. This peculiarity of certain substances by which they communicate a portion of their properties to the milk has long been taken advantage of in therapeutics. Thus, Haller cured certain colics in children by causing the nurses to eat the fruit of the *Anisum pimpinella*. Certain purgatives, as rhubarb and gratiola, purge the child when administered to the mother. Iodide of potassium and the proto-iodide of mercury, when taken by the latter, cure the former simultaneously of congenital or acquired syphilis.

A new-born child, says M. Godey, refused to take the breast for three days, and the pump had to be used three times in consequence. Finally, it concluded to suck, and immediately afterward vomited the greater part of the milk ingested. The same thing occurred for several days in succession. During the night, it took the breast of another nurse who had been delivered for a month, and no longer vomited. The mother's milk was abundant, but very serous; under the microscope it presented numerous granular corpuscles and very small milk globules. Nitric acid produced in it, after a few minutes, a lilac rose color, which was retained under the microscope by the masses of coagulated caseine. This woman had inhaled ether during her labor, and it is a question whether that penetrating fluid may not have affected the mammary secretion, so as to produce the disgust and regurgitation remarked in the child. It can only be determined by further observation.

CHAPTER II.

NURSING OF CHILDREN.

It must be evident from what we have stated, that everything is wonderfully prepared at the time of delivery for enabling the mother to suckle her child; but inasmuch as all are not equally fitted for fulfilling the latter duty, several kinds of nursing have been distinguished, each based upon the source of the milk designed for the new-born child, as also upon the mode of its administration. Generally, the mother supplies her infant with its first nourishment, and her lacteal secretion is entirely sufficient to satisfy all its demands. The mother may possibly be unable in some cases to furnish of herself all the milk that her offspring requires, and be obliged to supply her insufficiency by food from other sources. Sometimes she is altogether incapable of suckling her child, which is then confided to another nurse. Finally, there are cases in which, notwithstanding the impossibility of nursing on the part of the mother, she is unable to secure either a wet-nurse or an animal, and is compelled to have recourse to artificial nourishment.

The order which we shall follow in describing the various modes of nursing is based upon the varieties just indicated, and we shall treat successively: 1, of nursing by the mother; 2, of mixed nursing; 3, of wet-nursing; 4, of suckling by animals; and 5, of artificial nourishment.

ARTICLE I.

NURSING BY THE MOTHER.

The mother's milk, being designed by nature for the nourishment of the child, is certainly the best adapted to its requirements. Therefore, whenever the female is in good health, when her strength is not prostrated by any serious disease, when the antecedents of the family are such as to remove all doubts on the score of hereditary influence, there is every reason why she should yield to the promptings of nature. There is no necessity for being so strict towards the mother, as regards vigor of constitution, quality of the milk, and development of the breasts, as it is proper to be in choosing a nurse. Were we, in fact, to regard those women only as capable of nursing, who have the robustness and strength which we require in mercenary nurses, we should be almost obliged to relinquish the idea of seeing the majority of females in the upper classes suckle their own children. We often find persons of this description, who have but little milk, and that of medium quality, who yet raise very fine children; and what is singular, if these very same women should nurse another child, it is found to become emaciated for want of sufficient nourishment.

Without admitting that suckling protects newly-delivered women from many diseases to which they are liable when they do not nurse, and whilst acknowledging that it exposes them in a special manner to fissures of the nipple, and to engorgement and abscess of the breast, I regard it as so important to the child that I make it a point to recommend it in the absence of any formal contraindication, such as, a very lymphatic constitution, the presence of skin-disease, or of predisposition, hereditary or otherwise, to phthisis pulmonalis.

When a pregnant woman proposes suckling her child, the physician is often consulted in regard to her fitness for the task, and the future qualities of her milk. This question is usually very difficult to answer. Still, by taking in consideration the state of the constitution, the changes which the breasts undergo, and the quantity and quality of the sero-lactescent fluid which they furnish, (see *Lactation*,) we may be able, in the majority of cases, to form a tolerably correct opinion.

Sometimes the anticipations of the physician seem to be at fault during the first weeks subsequent to delivery. There are some individuals, who, having commenced nursing in opposition to the advice of their accoucheur, and finding their milk abundant at the outset, think themselves excellent nurses and make light of our fears; but, as M. Donné observes, this abundance at the first is not always a surety for the future: the least promising women often have considerable milk at the commencement, and the first milk is always rich enough for a new-born child. Everything seems to go on well, and it is not until after the lapse of six weeks or two months, that the diminution of the milk, the emaciation of the child, or the disordered health of the mother, begin to be perceived.

§ 1. Precautions to be observed in relation to Women who propose Nursing.

Most of the preliminary precautions have reference to the conformation of the nipple. The varieties which it presents may call for the employment of some preparatory measures, and even, in some cases, constitute a formal contraindication to the nursing. Thus, certain women have a very short nipple, so that it barely reaches the level of the breast, whilst in others, its place is occupied by a depression rather than a projection; lastly, in some, the nipple is extremely sensitive even before pregnancy, and during the cold season becomes chapped and fissured. When the nipple does not project at all, and especially when its place is occupied by a depression, suckling would prove so difficult for the child and so painful to the mother, that I advise its relinquishment altogether. Although the means employed hitherto for drawing out, and, as it were, moulding the nipple, are sometimes effectual when it is only too short, they rarely succeed in making it project when it does not exist at all, and often give rise to serious accidents. Thus it has been recommended:

1. To titillate the nipple frequently during the two last months of gestation; but this is irritating, often becomes painful, and has finally to be given up.

2. To use nipple shields. These are little concave plates of turned wood,

having a small excavation in the centre for the reception of the nipple. The patient applies this plate when she is dressed, and draws the gusset of her corset so as to press strongly upon it. The compression being applied on all parts except the nipple, causes it to project strongly, so that after wearing it for two or three months, the nipple is lengthened to the extent of three-eighths of an inch. When the mere application of the shield is not found to answer, a pump is adapted to its extremity, each stroke of the piston of which draws upon the nipple and occasions it to project. But as the skin of the nipple is subjected to incessant rubbing against the sides of the shield, it is liable to become inflamed in consequence. The same remark applies to the species of vials, furnished with a narrow opening, which is applied upon the nipple, and provided with a long curved tube, which enables the woman to produce tractions by exhausting the air with her mouth.

3. Direct and repeated suction is, doubtless, the best means that can be employed. This may be performed by the husband or an intelligent servant-maid. In the want of a sufficiently accommodating individual, a large puppy may be used, first taking care to wrap up its paws. The reason why suction is the best means that can be used is, that the gutter formed by the tongue keeps the nipple extended, and prevents the oscillating movements communicated by the pump. Besides, when the nipple is moistened by the saliva, it becomes more supple and extensible. After this suction, says Gardien, the nipple is to be washed with warm wine, in order to give firmness to the cuticle. The washing completed, they should be covered with tubes of white wax or gum-elastic, to keep them elongated and protect them from rubbing. To make the nipple-covers of wax, a piece of this substance is put for some time in warm water, in order to soften it, and its centre is next depressed with the finger or a thimble to a sufficient extent to receive the nipple.

The extreme sensibility of this part in some women who have never had children, also calls for the use of some means of hardening, of tanning a little, the skin which covers it. This is easily effected by the use of lotions, consisting of alcohol and water or astringent solutions, continued for several months.

These precautions, judiciously employed, often render nursing possible and even easy, which without them would have been impossible, or at least very painful at the outset.

§ 2. Rules of Nursing.

Everything being properly prepared, the mother is about to suckle her child. Now, in order to present in a regular manner the practical precepts which should govern the nursing, it will be useful to divide the time of its continuance into several principal periods, which, being characterized by peculiar phenomena on the part of both mother and child, give rise to special indications. We shall divide the nursing into three periods: the first ending with the milk-fever, the second extending beyond the term of six months, and the third until weaning.

First Period.—The first period is of very short duration, constituting, so to speak, the transition stage between the intra-uterine nutrition, whereby the child derived the nutritive elements ready elaborated from the maternal economy, and the suckling, properly so called, by which it still receives, indeed, a special nutriment from the mother, but one which has to undergo elaboration in its own intestinal canal before being assimilated. The phenomena which mark this period are, in fact, preparatory on both sides: on the part of the mother, whose milk gradually loses the characters of colostrum, to assume those of a more nutritive fluid; and on the part of the child, who gradually becomes accustomed to, and skilled in the performance of the new function, and who also finds in the fluid provided by the mother, purgative qualities, which clear out the intestinal canal, and thus prepare it for the digestion of more substantial food.

As we have already stated, the colostrum secreted by the mammæ at the time of delivery, or shortly after, is sufficient in quantity to satisfy the requirements of the child. It may, therefore, strictly speaking, be put at once to the breast, and the doing so would in many cases be attended with no inconvenience whatever. The efforts which it makes to suck are generally sufficient to excite or increase the secretion of milk in primiparæ. Still, as the mother's strength is often exhausted by the pains of labor, and she needs a season of rest and quiet after several sleepless nights, it would be cruel to oblige her to nurse her child immediately, there being really no occasion therefor. On this account, it is customary to defer it for seven or eight hours, after which time she is presented with her child. But as the latter would be inconvenienced by remaining so long without food, it is well to give it a few dessertspoonfuls of warm sugar and water, about an hour after its birth. This should be repeated every two hours at the soonest, or every three hours at the latest, until it is convenient to the mother to put it to the breast. This mode of procedure has the advantage of clearing the mouth and fauces of the mucus which so often obstructs them. Should the mother from any cause be unable to give it suck for several days, a substitute should be prepared, by adding about one-quarter of the amount of cow's milk to the sugar and water.

Some persons have imagined that the putting of the child to the breast might be deferred with advantage for twenty-four, thirty-six, or even forty-eight hours; and some authors would even have us wait until the milk-fever is over. This plan is liable to several serious objections. Thus, the child is deprived during all this time of a fluid whose nutritive qualities are perfectly suited to the condition of the intestinal canal, and whose laxative properties enable us to dispense with the purgatives so often required to expel the meconium in children which are brought up artificially. On the other hand, the sucking of the child facilitates the flow of the milk, prevents the inordinate swelling of the breasts and the pain which so often results therefrom; it gives form to the nipple, which is seized with much greater difficulty when the breasts are swollen and tense, and obviates the milk-fever almost entirely. Therefore, in the interest of both mother and child, we think it right not to nurse immediately after delivery, but also not to postpone it longer than from six to twelve hours.

Before putting the child to the breast for the first time, it is important to wash the nipple with warm water, in order to remove the concretions of sebaceous matter which may have collected in the bottom of the grooves in which the lactiferous ducts discharge. The washing has the additional effect to moisten it, make it more supple, and render it less unpleasant to the child.

It is necessary at the outset to put the nipple in the child's mouth; for as it is guided only by a blind instinct, it takes anything presented to it, and might seek for a long time without success. Most children perform very well at the first attempts; but this is not always the case, for, independently of the difficulties due to the shape and size of the breast and nipple, which difficulties we shall speak of hereafter, there are others depending upon the manner in which the breast is presented to it: thus, the face of the child being applied against the breast, if care be not taken, its nose will be stopped at the same time that its mouth is filled by the nipple, and, being unable to breathe, it withdraws from the breast. Therefore, it should always be seen to that the nostrils are kept free. At other times, the nipple, instead of being grasped by the upper surface of the tongue, into the concavity of which it should be received, is placed beneath the point of that organ upon the floor of the buccal cavity, whence suction is impossible. Levret mentions a remarkable disposition of the tongue, which is curved into a gutter, and adheres to the palate; in this case, it should be detached with a spatula. The motions of the tongue are sometimes hindered by shortness of the frænum, which also prevents it from being projected forwards. In this case, the frænum should be cut.[1]

As other circumstances which may render nursing difficult or impossible, should be noted certain sublingual tumors, hare-lip with division of the hard and soft palate, and the facial hemiplegia which so often follows the use of the forceps. As the latter accident is generally evanescent, the artificial nursing need be but temporary. The sublingual tumors should be incised or extirpated as soon as possible. The division of the hard and soft palate renders suckling almost always impossible.

---

[1] The frænum linguæ is sometimes, but more rarely than those accoucheurs seem to think who cut it in most new-born children, too long from before backward, at the same time that it is too short from below upward. The point, being then arrested against the lower parietes of the mouth, remains behind the alveolar ridge, and can hardly be put forth between the lips. When the child cries strongly, the tongue is seen to be held downward and forward by a transparent partition, which prevents it from being raised and carried forward.

The operation to be performed is of the simplest character. The head of the child being held slightly backward, an assistant pinches the nose to oblige it to open its mouth. The frænum is engaged in the slit of the plate attached to the grooved director, and then raising the tongue forcibly, the surgeon, holding a pair of blunt scissors in his right hand, divides the frænum at a single stroke, taking care to direct the point of the scissors downward and the farthest possible from the tongue.

The accidents to which the operation is liable are: 1, the falling backward of the tongue into the pharynx, witnessed three times by J. L. Petit, and which would have suffocated the child had not the organ been promptly restored to its position by the finger; 2, hemorrhage from wounding the ranine veins. It is the more important to detect and suppress the hemorrhage, as it would be kept up by the constant movements of suction or deglutition. It is remedied either by touching the bottom of the wound with a fluid caustic or by cauterizing the injured vessel by means of a stylet heated to whiteness; or, lastly, by Petit's bandage. This consists of a fork of wood, an inch and a quarter in length, covered with linen, one end of which rests against the symphysis of the lower jaw, whilst the other embraces the apex of the wound. It is held in place by a small bandage placed across the mouth, assisted by another turn, then crossed below the jaw, and carried up above the ears, to be fastened to the child's cap.

Some children, either from congenital debility, or from sloth, or want of activity, seem as though they would not take the trouble to suck. After putting the nipple far back in the mouth, the mother should be directed to move it about, in order to tickle the tongue and solicit its action. With the same object, the nipple might be pressed a little, so as to project a few drops, or what is better, since this is difficult in primiparæ, a piece of linen dipped in sweetened water should be squeezed upon the base of the nipple, which would conduct the fluid between the lips applied to its extremity.

Notwithstanding all these efforts, certain children seem unwilling to make any attempt to suck, neither do they indicate any want by their cries, but sleep almost constantly. The mothers are gratified by this repose of the child, which affords them opportunity of enjoying the quiet which they so much need, and are careful not to disturb it by putting it to the breast. But when it awakens after a longer or shorter time, or when, becoming anxious on account of its prolonged sleep, the parent takes it up, it is found to have lost all its energy, cries very feebly, and is unable to suck. No time should then be lost in endeavoring to stimulate it in every manner possible. It should be undressed, placed before a warm fire, and rubbed actively with flannels either dry or moistened with camphorated spirits. It should be obliged to take the nipple if possible, and not succeeding in this, it should be put to a nurse, whose milk flows freely, and who can gradually express a few spoonfuls into its mouth. These poor children can generally be restored in this manner; but we are often obliged to let them remain for a few days with a wet-nurse, whose milk flows so freely as scarcely to require any effort at suction, before returning them to their mothers.

The condition just mentioned is far from being uncommon; and, for my own part, I have several times had charge of children who, in this way, have inspired me with the greatest anxiety. Therefore, we should always advise the mother never to allow more than two or three hours to pass without giving drink or suck to her child, and, at any rate, always to waken it.

The first attempt at sucking soon fatigues it, which is explained both by its weakness, and the effort which it is obliged to make. Thus, during the first two days, it can hardly perform more than four, six, or eight regular and continuous suctions, before it is obliged to stop and begin again after a few moments. The interval between each attempt is generally longer as the child becomes weaker, either on account of its increased debility, or because it has nursed so recently. Sometimes it even falls asleep upon the bosom after some efforts, and has to be awakened by striking it lightly upon the cheeks, buttocks, or feet. The acts of sucking are occasionally so distant, that the child may remain in this way at the breast for half an hour, or even longer.

Now, this slow nursing may become very painful to the mother. In France, women generally sit up in bed for the purpose, and when obliged to remain long in that position they find it very fatiguing. It is precisely to avoid this that I would desire to popularize the practice that I have seen adopted with the greatest success by American women, namely, to lie on the side corresponding to the one on which they intend to nurse, and placing the child lengthwise with the breast, allow the nipple to fall into its mouth. They may retain this position for a long time without experiencing any fatigue.

During the first days, it is very important to watch the child very closely whilst at the breast, so as to be sure that it really sucks and swallows the milk. Either because the milk comes with too great difficulty, or because the child will not, or cannot, make the necessary effort, it is seen, indeed, to make certain motions of the cheeks resembling suction, and yet does not swallow. If a finger be placed upon the larynx, we shall be able to tell by its movements during deglutition whether the latter is accomplished. Besides, a sort of rustling sound is often heard produced by the passage of fluid from the mouth into the œsophagus.

When the child has been put to the breast from the first day, the milk-fever will rarely be considerable. The frequent emptying of the breasts by the child also prevents them from becoming distended and painful. Some women, however, have so much milk at this time, that the mammæ are exceedingly swollen and the nursing becomes, temporarily, more annoying to the mother and difficult for the child. It is more troublesome to the mother, because the sucking gives pain, and the swelling of the gland extending even to the axilla, causes suffering when the arm is brought down to the chest, which has to be done in order to hold the child properly; it is more difficult for the child, because this extreme distention renders it less able to seize the nipple. The swelling of the mammæ effaces or depresses the latter, until it can no longer be grasped by the lips of the child. When this occurs, it is often necessary to empty the breast by means of a pump. The withdrawal of a certain amount of milk relieves the pain caused by the swelling, and restores the nipple to its usual length.

As the child obtains but very little milk at a time for the first few days, it should be put to the breast at very short intervals. Still, it is well to accustom it to a certain regularity in the time of taking its repast. Children always suffer from irregularity in their meals, sometimes leaving too long an interval between them, and sometimes introducing a fresh portion of milk into the stomach before giving them time to digest what they had recently taken. Without pretending to mathematical precision, we would state that the new-born child ought to nurse at intervals of about two hours at the shortest, and of three hours at the longest. When it is feeble, or born prematurely, and therefore able to take but very small quantities at a time, the intervals might be shortened. We must, I think, allow it to judge for itself of the amount that it shall take at each time, except under peculiar circumstances. What would be plenty for one, would be insufficient for another, besides, as children are capable of rejecting the surplus from their stomachs, there is no great harm in allowing them to take rather more than they really need.

Second Period.—When the milk-fever is over, the breasts are in full activity, and from that time commences the nursing properly so called. Although it is unusual to have to contend any longer with the difficulties mentioned as pertaining to the preceding period, there are yet some precepts which may be usefully applied.

The first care to be taken before giving the child suck, is to be sure that it really needs it, for it ought never to be put to the breast for the sole purpose of stilling its cries, as, unfortunately, most young mothers are nearly certain to do.. The fact is, the cry is not always to be taken as an expression of suffering or of real want. The child cries as we speak; very often, it is simply an act whereby it indicates its individual existence, and is so habitual during its earliest days, that it sometimes seems to indulge in it as a matter of enjoyment. Some children cry without any appreciable reason, and yet, notwithstanding their continual agitation, and often long sleeplessness, do not seem to be any the worse for it. Such children the nurses commonly call *bad*, and the epithet is tolerably well deserved.

To judge whether the cries of a child are indicative of a desire to nurse, we should take into consideration the other signs which accompany them, as also the time of its last repast. The cry of hunger is generally attended with active movements of the upper extremities. The child turns its head from right to left, and opens its mouth as though seeking for the breast; it seizes eagerly the end of the finger, or any soft and round body that may be placed between its lips, and sucks at it repeatedly.

When the proper moment arrives, before presenting the breast, the nipple should always be moistened either with a little milk or saliva. Then, the mother holding the child in her arms and resting its head upon one of them, puts the nipple in its mouth, taking care to press lightly upon the areola so as to project a little milk, and intimate, as it were, to the child, that it can suck with advantage. These precautions are hardly necessary except during the earliest weeks, for after this it throws itself upon the breast and seizes it so powerfully as to make it a painful operation. In some cases even, so far from exciting it, it is necessary to restrain its avidity by withdrawing the nipple from time to time, as when, not having nursed for several hours, it swallows in a rapid and gluttonous manner.

The mother should put it to both breasts at the same meal; they are thus kept disengorged, and by dividing the service, the nipples have time to rest from the effort of suction which often irritates and inflames them. The child is also thus early accustomed to nursing from both sides. If, as often happens, it appears to prefer one side in particular, and refuses to nurse from the other, that breast should be first presented which it seems to prefer the least. Hunger will soon overcome its repugnance, so that after some hesitation it will conclude to take the breast which it would have refused if presented the last.

It is well to watch the child attentively whilst nursing, at least during the first weeks. It will then be ascertained whether the sucking is apparent or real by observing the motions of the larynx during deglutition, as also by hearing the sort of rustling of which we have spoken. The amount of milk which it takes can be judged of more certainly by noting the length of time which it rests though still retaining the nipple in its mouth. It often sleeps after nursing; the warmth which it receives from the mother whilst lying in her arms, and the sort of enjoyment which it finds in keeping hold of the nipple, also, when it has sucked quite recently, the repletion of its stomach, all tend to invite slumber.

As soon as the child is discovered to be sleeping, it should be awakened at once and caused to suck again, if there is reason for thinking that it has not had enough; but when the contrary is the case, it should be taken away immediately and laid in its cradle. The infant soon contracts the habit of falling asleep and sleeping with the nipple in the mouth, and ere long it becomes impossible to put it to rest otherwise. It is plain that the practice must be fatiguing to the mother, especially at night.

It is very difficult to determine the quantity of milk that it should be allowed to take at each repast, and how long it ought to be permitted to suck. The latter will evidently vary with the abundance of the milk, the ease with which it flows, and the length of time that the child rests. As we have said, there is no objection to allowing it to become satisfied in the absence of special indications suggested by disease.

The child should be nursed less frequently as it grows older. After the first two or three weeks, it will be sufficient to give it the breast every three hours, and if the milk is of good quality, the intervals between the repasts may be still further lengthened towards the third or fourth month; this distribution must, however, be somewhat modified in the day or the night. The intervals of nursing at night must be greater from the beginning, so that it shall suck but three times from ten o'clock in the evening to five or six o'clock in the morning. After a month, even the intermediate repast may be relinquished. If the child sucks but little at a time on account of debility, and therefore seems to require the breast oftener, a little diluted cow's milk may be given once or twice in its stead.

There can be nothing absolute as regards this determination of the hours for nursing; for although we have recommended that the child's sleep be interrupted in order to give it food, this should not be done at a more advanced age. A child of from two or three months old will always awaken spontaneously when it feels the want, and the dangers that we have spoken of are no longer to be feared. Therefore it may be allowed to sleep on. Still, these precepts should be conformed to, for by leaving a proper interval between the repasts, the child receives sufficient food, it has time to digest what it has taken, and the acid regurgitations, and the passage of curdled but otherwise unaltered milk, the sure indications of a bad digestion, are avoided; besides this, it has the advantage of preventing the enormous embonpoint, the puffy cheeks, and dead hue of the skin which sometimes indicate a weak constitution.

This plan is attended with the happiest results, especially for women of the upper classes, for whom sleep, and that undisturbed, deep, and sufficiently long, is even more necessary than food to the reparation of their forces. Most of the nervous women of large cities should have at least six or seven hours of good uninterrupted sleep, under the penalty of being obliged to wean their children very early; then, after having nursed the child about five o'clock in the morning, they may take another nap of two or three hours, if they require it. It would be a great mistake, says M. Donné, to suppose that the children suffer from this system. When observed from the beginning, they sometimes become accustomed to it, without having any trouble in sleeping as long as their mother, and they never suffer from the cow's milk that is given to them. They are thus trained to take the bottle, so that should anything afterward oblige the mother to suspend nursing temporarily, there would be much less difficulty in engaging them to accept the artificial nourishment, for which children who have never known anything but the breast sometimes manifest an invincible repugnance.

Sleep is so necessary to nursing women, that not only should they never give suck, but, whenever possible, the child should be kept from its mother at night. Having obtained an intelligent and faithful nurse, she should be intrusted with the care of watching over the child, giving it drink at night, and taking it to the mother only at stated times.

Third Period.—As the object of the first period was to prepare the child for receiving a special elementary nourishment, it is proposed in the latter gradually to remove it from the mother, and so accustom it to all kinds of food; in a word, to render its existence entirely independent. Therefore, the office of the physician is limited to determining the period at which other food may be added to the mother's milk, as also the time when it may be proper to wean the child entirely.

Practitioners are far from being unanimous in relation to the period at which other food than the mother's milk should be given to the child. "Nurses from the country," says Desormeaux, "are usually in the habit of giving to their children a sort of pap made of fine wheat flour and cow's milk, after the first week; they are impressed with the idea that this food relieves the colic, to which new-born children are very subject. Whether it really has this effect, or whether the digestion, by being made still more difficult, throws the child into a kind of torpid condition, it is often observed to be more quiet after taking it; at the same time it produces a favorable change in the color and consistence of the excrements. On the other hand, when the children are confined to the mother's milk, provided it is sufficiently rich and abundant, they are not more subject to flatulent colic than others. From all this I am disposed to infer that the first method, when prudently followed, is without inconvenience in the majority of cases, whilst in certain others it may be advantageous. Nevertheless, I am persuaded that the latter is the best and surest, especially for weakly children." Desormeaux's conclusion seems to me to lack precision, and I only quote it here for the purpose of opposing the tendency it might have to encourage certain prejudices which, unfortunately, are but too widely prevalent. The paps, soups, &c., which are given to children in certain countries almost as soon as they are born, are at least useless and often dangerous. There are, doubtless, strong and robust children who may swallow them without inconvenience. But would they have thriven less had they been confined to their mother's milk? This is what I deny, and have at the same time no hesitation in asserting that such a regimen would prove dangerous to the greater number.

When the mother is a good nurse, that is to say, when the performance of her duties does not fatigue her, and the milk remains unchanged in quality and amount, the child should be restricted to it as far as possible for the first six months, with the exception of the additions mentioned for the night. We shall see hereafter, when treating of the mixed method, what the reasons are which may lead to a modification of this rule, and to which I shall submit unreservedly whenever a hired nurse is concerned. Desormeaux thinks that the air of large cities is generally less pure and stimulating than that of the country; and therefore, that the child should be supplied sooner with a species of nourishment capable of supplying, to some extent, the deficiencies of the air. He adds that the same is true as regards children brought up in low and moist places, as also for those of a lymphatic temperament, or whose parents are feeble. Neither can I agree on this point with the celebrated accoucheur. Doubtless, when the bad constitution of the children is due to the mother's weakness or the defective quality of her milk, cow's milk, and not broth or pap, should be substituted for it; but I cannot think that a residence in cities, or in low and moist places, is a sufficient reason for an earlier administration of food, which is unnatural to the child. Infants living under bad hygienic conditions suffer from a susceptibility on the part of the intestinal canal, to which the robust children of the country, whose digestive powers are far more developed, are not liable. To give a feeble and delicate child food of difficult digestion is to task the alimentary canal beyond its powers, and could only result in incomplete elaboration and imperfect assimilation; fortunate indeed would it be, should it not give rise to chronic enteritis, with its attendant diarrhœa and emaciation.

Kinds of Food.—Farinaceous substances ought to be prepared, such as wheat, and rice flour, potato starch, and arrow-root, in connection with milk, so as to form a well-cooked pap of variable consistency; wheat flour slightly dried in the oven, taking care to avoid roasting or browning it, which would injure a portion of its nutritive elements, is generally chosen. This flour, which contains a large proportion of gluten, is very nutritious. The articles mentioned may, however, be varied to suit the taste and condition of the child. Thus, rice cream would be preferred if the child were somewhat debilitated, potato starch as a refreshing diet, and arrow-root as a light food. Panada, made of well-baked wheaten bread, dried in the oven and then reduced to a coarse powder, forms an excellent diet. It is boiled for several hours with a sufficient amount of water, and afterward passed through a silk or hair sieve.

About five or six dessert-spoonfuls of these preparations may be given at first every morning. Before long, they may be administered twice a day, besides having added to them shortly, semoule or vermicelli, well cooked. When the child is seven or eight months old, it may take chicken-broth or light soups. A little later, it can have the yolk of a boiled egg, carefully rejecting the white, and finally, it may be allowed to suck a piece of fowl, or, preferably, a bone of fowl, also a crust of bread which it can chew and swallow only after having moistened it sufficiently with saliva.

The water reddened with claret and sweetened slightly, which M. Donné recommends giving after the age of six months, should, I think, be withheld rather longer, and even then ought to be administered very carefully.

As the child becomes accustomed to other food, it seeks the breast with less avidity, although still retaining a marked predilection for it. The mother can then suckle it less frequently without disadvantage. Toward the seventh or eighth month, she need nurse it but four or five times a day, and still later, two or three times, in the meanwhile ceasing to give it the breast at night altogether.

This progressive diminution habituates the child to doing without the breast, develops its taste for other food, and also decreases the flow of milk; so that weaning becomes easier for the child and less troublesome to the mother.

ARTICLE II.

WEANING.

At what age ought the child to be weaned? The natural period is that at which the first dentition is accomplished; for not until then is the child provided with the organs necessary to the mastication and insalivation of the food. But it often happens that the first dentition is not completed for a year or a year and a half, and it is very unusual to defer taking the child from the breast so long as this. The delay would be attended with serious disadvantage to both mother and child; the mother would become exhausted by her long nursing, and her milk finally lose its good qualities; besides this, the children themselves, after a certain age, seem to require more substantial food; some, in fact, retain a pallor and puffiness of the features, as well as general debility so long as they continue to nurse, and assume a rosy hue, a lively and happy expression, and firmness of flesh, as soon as they become accustomed to a more nutritious food.

When care has been taken to habituate the child to something else than milk from the time it is six or seven months old, but little difficulty will be experienced in weaning it completely; and nursing may be given up without disadvantage, as soon as dentition has made considerable progress. Still, I think it very important to take into account the greater or less rapidity and facility with which the evolution of the teeth is accomplished. As a general rule, weaning is not to be thought of before the child has from eight to ten teeth, which would be about the age of twelve or sixteen months. But if the dentition is delayed, painful, or accompanied by some of the affections to which the child is liable in its second year, there is an advantage, whilst giving the child other food, to keep it at the breast, allowing it to suck at least two or three times a day.

It is, indeed, an invaluable resource during the sufferings of painful dentition. The child then refuses other kinds of food, and will take nothing but the breast, so that it would be very difficult to nourish it if weaned prematurely. Therefore, a system which at once provides it with food and alleviates its sufferings, must be very desirable. In cases of retarded and painful dentition it would be prudent to continue the nursing till the child is eighteen or twenty months old.

To fix upon any particular period for weaning, says M. Trousseau, is simply absurd, and for this reason: Weaning should always be subordinate to dentition. The fact is, the period of the first dentition, from the appearance of the first incisors to that of the last molars, is fraught with peril to the child. It is subject to a multitude of disorders affecting the abdomen, the chest, and the head, especially the former. Now, as the so-called disorders of digestion are the most frequently observed, it is important to be provided with a diet which the child shall not refuse, and which can neither aggravate its condition, nor give rise to any other disease. But dentition lasts for three years: must the suckling be continued all that time? No, not absolutely; we should be guided by the following rules; they are very easily remembered.

The teeth are evolved in groups. How do they appear? There are several series, as follows: in the first, appear the two lower median incisors; in the second, the four upper incisors; in the third, the four first molars and usually after them the two lower lateral incisors; in the fourth, the four canines; and finally, in the fifth, the four last molars. These are the deciduous teeth.

Let us next see how the groups make their appearance:

1. The first incisors come through at an interval of from one to fifteen days, though generally on the same day; and when these two first do not appear within two or three days of each other, the dentition is irregular. When this is over, the child rests; a fact of immense importance as regards therapeutical measures. It rests from three to six months. The two first teeth usually appear between the seventh and eighth month, and the child has afterward at least six weeks of quiet.

2. The four upper incisors are a month in coming through. First the middle, and then the lateral ones appear, and that between the tenth and twelfth month.

3. From the twelfth to the fifteenth month, those of the third series come through: then the child rests for four or five months, during all which time the evolution of teeth is suspended.

4. Between the eighteenth and twenty-second month, the four canines make their appearance, and are three months in coming through, after which there is a very long repose.

5. Lastly, the child gets its four last molars.

It is well to know that the teeth appear in groups, inasmuch as the child is sick during the period of a dental evolution. It coughs and has fever, but after the teeth are through, recovers with astonishing rapidity. Thus it is throughout the entire period of dentition. Now, what is the right time for weaning? Evidently it should be in the interval between one evolution and another, and about seven or eight days after the teeth are through, and while the organs are in a state of rest. We have thus an advantage of several months, wherein the child can be accustomed to a new diet.

After which of these evolutions is it best to wean the child? After that of the canines, as being the most dangerous: the latter appear singly, and are the only ones which are crowded. The others meet with no impediments, and none but the canines are embraced by the neighboring teeth, which they are obliged to press asunder. Therefore it is that the cutting of these teeth is accompanied with more severe symptoms.

When it is decided to wean a child which has been for some time accustomed to eating, it is generally better to do it at once than to leave off nursing gradually; for by continuing to allow it to suck only once or twice in the twenty-four hours the milk becomes altered, and might prove injurious. It is, however, advisable to begin at night, and, without considering it a matter of great importance, I would prefer the spring or summer to winter for commencing.

The mother ought, as far as possible, to give up her child to another person, who should supply it with drink, and render it all necessary attention. Some children, so long as they know that their mother is near them, refuse to take any other food, and it is hard for a parent to resist the tears and entreaties of her infant. Should it be impossible for the mother to put away her child, she ought to try to disgust it by covering the nipple with some substance of disagreeable taste and odor, such, for instance, as aloes or mustard. I have rarely failed to succeed with the latter, for most children reject the breast with disgust after having once tasted or even smelled it.

ARTICLE III.

REGIMEN OF NURSING WOMEN.

We have but few remarks to make in relation to the precautions which should be observed by a young woman who proposes nursing her child. A good diet is indispensable for women who have to support the fatigues of nursing. Rich and succulent food, beef-broth, white and dark meats, whether roast or broiled, should, doubtless, form in great measure the principal elements of the meals; still, they ought not to be debarred from vegetables, milk, chocolate, and broiled preparations of the various farinaceous substances. They should avoid highly seasoned ragouts, and an excess of salt, pepper, vinegar, and other strong and indigestible condiments. The usual drink should be claret and water; the use of pure wine, alcoholic liquors, and coffee, require great discretion, and it were far better to abstain from them altogether.

The number of meals should generally be governed by the habits of the individual. It is well, however, that they should not be too far apart, nor so copious as to give rise to indigestion.

We have already insisted on the propriety of the mother's obtaining a sufficient amount of sleep, and revert to it only for the purpose of fixing attention upon its importance; for without it, most of the females in large cities would find it impossible to nurse.

A nursing mother ought to breathe a pure air, avoid dampness and cold, and take a sufficient amount of exercise. The warm bathing which some persons prescribe, I approve of when not too long continued, and only for the preservation of cleanliness.

A residence in the country certainly is one of the best hygienic conditions both for herself and child, which often finds in frequent insolation and pure air a substitute for deficiencies in the quality of the milk.

The breasts should be carefully protected from the air, especially at the outset, and the child should not be suckled in a cold and damp garden. I have known several ladies to be attacked with inflammatory engorgement of the breasts from a neglect of this precaution.

The chest ought to be kept constantly covered with a piece of soft linen folded in several thicknesses, and changed as soon as it becomes moist.

When the breasts are very large, they should be supported by corsets with ample gussets; for the mere weight of the glands is sometimes sufficient to render them painful and give rise to engorgement.

Some women have so much milk, that when the child sucks on one side, it escapes freely from the other. To prevent the linen from becoming too much moistened in this way, the nipple is sometimes introduced into the neck of a sort of very flat bottle, which receives the milk as it escapes.

Finally, nursing women cannot be too strongly recommended to avoid sadness and violent moral emotions; we have already explained at length the effect which they might produce. "It may be said, in a general way," M. Donné remarks, "that calmness and equanimity are what young women most frequently lack." So essential a condition is this, that I take into deep consideration the nervous condition of the mother when judging of the propriety of her nursing, and if she is too excitable, I prefer intrusting the child to a wet-nurse. A mother whom the least cry of her child fills with anxiety, and who cannot see it fretful or in pain without being overcome, will hardly fail to make a bad nurse. A child is rarely brought up without suffering some derangement or other of its health, and sometimes even serious disease. It is precisely on such occasions most important to have the milk perfectly pure, which it never can be from the breast of a mother who will not, or cannot control her emotions.

ARTICLE IV.

OF THE CIRCUMSTANCES WHICH MAY RENDER NURSING BY THE MOTHER DIFFICULT, AND OF THE ACCIDENTS THAT ARE LIABLE TO INTERFERE WITH IT.

§ 1. Impediments to Nursing.

We have already treated of such malformations of the nipple as may sometimes be remedied by timely interference. There are some, however, such as the absence of this part, and its entire imperforation, which render nursing impossible; but even those of the kind first mentioned, such as shortness of the nipple, may make it equally impracticable, when not discovered until after the birth of the child, and when about to put it to the breast.

The shortness of the nipple may be only relative, that is to say, though long enough for a strong child accustomed to sucking, it is too short for the new-born infant, who cannot take it, or is unwilling to do so. In such cases, it is well before putting the child to the breast to render the nipple rather more projecting by titillating it with the fingers, drawing it out by a pump, or having it sucked by a puppy, an adult person, or, still better, by a child from six weeks to two months old. The latter is preferable when it is reasonable to suppose that the difficulties resulting from the shortness of the nipple are increased by the weakness or the unwillingness of the child. A strong and vigorous infant, furnished by another nurse, would be able to take the breast of the recently delivered female, and give shape to the nipples, whilst, on the other hand, the new-born child, deriving its nourishment with ease and in abundance from the breasts of the nurse, grows rapidly stronger, becomes accustomed to sucking, and after a few days may be returned to the mother, who is then able to present it with properly formed breasts. Care should be taken not to select too old a child; for, knowing its nurse, it would be unwilling to take the breast of another woman.

Finally, as a last resort, the artificial nipples, in their most modern and improved form, may be tried. Those made by M. Charrière of softened ivory, I think preferable to any others.

§ 2. EROSIONS, EXCORIATIONS, CHAPS, FISSURES, AND CRACKS OF THE NIPPLE.

These various affections, implicating the nipple or its base, bear the strongest resemblance to each other, and hardly differ except in extent, and more especially in their situation.

Excoriation, of which *erosion* is but the first degree, is a small, superficial wound of the skin, in which the derm is laid bare by the removal of the epidermis.

When it has become so large and deep as to destroy the surface of the derm, it constitutes an *ulceration*.

It has no special seat, but may affect the entire surface, or only one or a few points of the nipple. Its surface is often of a bright red color, granulated, and frequently swollen; sometimes it is always moist, at others covered with thin scabs. Occasionally, sucking is followed by a slight effusion of blood.

The *chap* results from the drying up, and imperfect removal of the epidermis, the dried cells of which resemble small scales.

The *fissure* is an elongated ulceration, generally deeper than the simple excoriation. It forms at the bottom of the furrows, and takes their direction; usually, and then too it is the most painful, it occupies the groove separating the base of the nipple from the rest of the skin.

Cracks are an exaggeration of the fissures, from which they almost always originate. They differ from the latter by the cracked, swollen, and extremely sensitive condition of the surrounding skin.

Inflammation of the skin of the nipple is the usual cause of the erosions, excoriations, and ulcerations which succeed them; though in some cases, according to M. Deluze, (*Inaugural Thesis*,) they are formed in the following manner: When the child seizes the nipple, it is placed in a gutter between the tongue and the palate, so that all the efforts at suction are brought to bear upon the extremity of the nipple towards which the fluids tend; as this part is supported by nothing, it gives way, and a small, bloody streak can be detected upon it after nursing. In some cases, the only effect of the suction is to raise the epidermis, and form a sort of pouch or red spot, beneath which a slight ecchymosis is discoverable; finally, either in consequence of another act of nursing, or spontaneously, the raised portion of epidermis dries and falls off, and excoriation follows.

The extension of the latter into the grooves of the nipple gives rise to the fissures.

Simple excoriation is far more common than fissures produced at once or by rupture. Thus, of 17 cases observed at the Clinique by M. Deluze, there were but 4 cases of a spontaneous character.

I regard exposure of the nipple to cold, when yet warm and moist after sucking, as the most frequent cause of chapping. Fissures and cracks may, no doubt, also take their origin in inflammation or the impression of cold, inasmuch as they so often follow ulcerations and chaps; but besides this, they may often be produced mechanically, by the violent tractions upon the nipple during the act of sucking.

They occasionally appear after the child has taken the breast two or three times. The sucking first produces acute pain, followed by violent smarting. A superficial examination of the breast discovers nothing; but if the nipple be drawn upon gently, so as to widen the furrows which traverse it, a slight redness with serous effusion will be found at the bottom of one or several of them. The fissure is not yet formed, but soon makes its appearance after a few more nursings; as each application of the child to the breast tends to increase it, a true crack is shortly formed, which becomes covered with a scab or crust, beneath which it is common to find a small amount of extravasated blood.

However produced, these accidents generally occur in the early days of lactation. The normal sensitiveness of the nipple is not as yet blunted, nor has the skin covering it had time to become accustomed to the pressure and tractions which it is destined to undergo. However, although these ulcers or cracks rarely occur after the tenth day, I have known them to be formed at a much later period, in which case they seemed to me to have been occasioned by the biting of the child, and sometimes by an aphthous inflammation affecting the latter.

These slight accidents are generally suffered by women who nurse for the first time: such as have a fine and irritable skin, whose breasts were very sensitive even before pregnancy, those whose nipples are badly formed, or who wait for several days for the milk to come before putting the child to the breast, thus obliging it to grasp the nipple more strongly with its lips, and to make greater effort to extract the milk, are peculiarly exposed to them.

Slight excoriations and ulcerations are generally supported without much trouble; which is far from being the case with the fissures and cracks, which are commonly exceedingly painful. Those situated at the base of the nipple, I have thought, occasion the most suffering. When we remember the painful sensations resulting from the cracks that are liable to form on the median line of the lower lip in winter, we may easily imagine the effect of those on the nipple. The evident tendency of each act of suction is to separate the margins of the little ulcer. Notwithstanding her desire to nurse the child, the mother dreads the approach of the stated times, and instinctively recoils when the babe is brought for the purpose. At the moment of seizing the nipple, she is often compelled to cry out, and continues to groan for several minutes. Generally, the sensation is less acute after the first few moments, but is renewed with dreadful intensity whenever the child recommences sucking after having stopped, and especially when it seizes the nipple again greedily, after having relinquished it altogether. The suffering is sometimes so intolerable, that these unfortunates are observed to bite their clothes or coverings, to avoid crying out, whilst others writhe or are even affected with convulsive movements.

If the crack is deep and the suction strong, some blood flows from the edge of the wound. This becomes mixed with the milk and is swallowed. Should the child vomit, it is found in what is thrown up, but if not, it is expelled in the stools, and leaves its mark on the diaper. The physician should remember this fact, for he is often consulted by parents who inquire in great alarm the meaning of these bloody passages. The explanation is almost always to be found in fissures of the nipple, of which the woman had not, perhaps, complained hitherto; but should he neglect making the examination, he might suspect hemorrhage of the bowels, and thus help to continue fears which are really without foundation.

The irritation affecting the fissures is very often propagated to the skin of the nipple, thence to the areola or the cellular tissue which lines it, and next, more deeply to the gland itself or to the interlobular tissue, thus giving rise to abscesses of the areola, or to those of a phlegmonous or glandular character. On the other hand, the suffering is sometimes so severe that the mother avoids nursing from the affected breast as much as possible, thus helping to produce its engorgement and the abscess to which it gives rise. We would add, finally, that in consequence of the long detention of the milk in the ducts, it becomes deteriorated, and assumes the characters of colostrum.

The sufferings occasioned by these ulcerations of the nipple, and the serious accidents which often result from them, show, evidently, that they ought to be prevented, and when they exist, to be cured as soon as possible.

The difficulties in nursing due to the shortness and malformation of the nipple being generally the cause, the best prophylactic means are those already mentioned. The delicacy of the skin, and the extreme sensitiveness of the nipple, will be advantageously treated by astringent lotions, frequently applied during the latter months of gestation. Without having any great confidence in the value of ointments for producing this result, M. Dubois made some experiments for the purpose of testing them. He caused frictions with the following compositions, to be made for a month before delivery, viz., tannin, one drachm; lard, one ounce; or with a mixture of equal parts of cocoa butter, oil of sweet almonds, and tannin. For my own part, I prefer the astringent lotions; they have not, like most fats, the inconvenience of soiling the linen, becoming rancid, and sometimes of irritating very delicate skins.

Like M. Trousseau, I am convinced that when the woman begins nursing, the best prophylactic measure is simply to wash the nipple with a fine sponge as soon as the child quits the breast. Its saliva is acid, and should a little caseine remain behind, nothing more is required to produce excoriation. It is well to make these lotions with a slightly astringent solution. They should, however, be done quickly, so as to expose the breast to the air for the shortest time possible, and the nipple ought to be covered at once with a little hood of lead with a hole through its extremity, in order to protect it from the contact of cold air and the friction of the clothing.

The use of prophylactic measures cannot be insisted on too strongly, for, unfortunately, the curative means hitherto employed leave much to be desired. They are, however, numerous, and I know of no disease against which so many ointments, solutions, &c., have been recommended; but here, as is always the case in therapeutics, abundance means dearth; there is much less seeking when an infallible remedy is at hand.

In order to account for the popularity which some of these preparations have enjoyed, it is only necessary to be aware that happily, in a great number of instances, these fissures or excoriations get well of themselves. The poor mother gradually becomes accustomed to the pain; she continues to nurse, and when the cracks are not very deep, and especially when not situated at the base of the nipple, they undergo spontaneous cicatrization.

The cessation of nursing is the best remedy of all; but it must be confessed that this is too discouraging to certain mothers who attach great importance to suckling the child. We shall therefore mention some of the chief topical applications which have been used with a certain amount of success.

M. Trousseau recommends, that when excoriations or fissures appear around the nipple, that lotions with warm water should first be practised, and followed by a weak solution of nitrate of silver. If these are not sufficient, a solution of sulphate of copper or of zinc may be employed; and, finally, when the affection persists, he would have recourse to the white precipitate ointment, viz.:

White precipitate,[1]	4 grains.
Lard, ...	2 to 4 drachms.

I have used this ointment with some success at the Clinique. It is necessary to clean the breast well before putting the child to it, and to renew the ointment immediately afterward. Although I have observed nothing which could be attributed to absorption of the ointment, there is reason to fear lest the health of the child might suffer if the breast is not carefully wiped.

M. Dubois appears to have tried, without advantage, the oil of cocoa, nitrate of silver, collodion, and creasote. The first acts like any other fatty matter, by protecting the wound from contact with the air. *Collodion*, which promised much in the way of shielding the diseased surface from the action of the infant's mouth, and of preventing the dragging of the lips of the wound, whilst permitting the nursing to continue, has failed. The saliva gradually detaches the solidified lamina of this substance, and not unfrequently it is loosened by the cutaneous perspiration. The application of creasote is very painful to the mother, and its smell is so repulsive that the child refuses to take the breast.

Cauterization with the nitrate of silver sometimes succeeds when the pencil is finely pointed and carried to the deepest part of the ulcer; but almost always upon condition that the nursing shall be suspended immediately afterward. This, however, is not practicable when both breasts are affected; it exposes greatly to engorgement when it can be done; and facts which have come under my observation, incline me strongly to believe that the cauterization itself may give rise to phlegmonous inflammation of the breast. Finally, I would add, that if nursing is resumed too soon after the ulcer is cicatrized, it would open again upon the first suctions. It is, therefore, upon the whole, useless when the nursing is continued, and uncertain, and often dangerous, when the latter is interrupted.

---

[1] The white precipitate (*précipité blanc*) here alluded to, is the same as the precipitated calomel of the Dublin Pharmacopœia: *not* the white precipitate (hydrargyrum ammoniatum) of the United States Pharmacopœia.—TRANSLATOR.

Mr. Startin, a London physician, has recently extolled the use of glycerine, or the sweet principle of oils. It is a substance produced abundantly during the saponification of fats, and especially in the manufacture of stearine candles. Glycerine does not evaporate at ordinary temperatures; on the contrary, it absorbs moisture from the air; it is soluble to any extent in water, so that it may be easily removed from the part to which it is applied.

The following are Mr. Startin's formulæ against excoriations and fissures:

℞.—Gum Tragacanth (pure)	2 to 4 drachms.
Lime Water,	4 ounces.
Distilled Rose Water,	3 "
Purified Glycerine,	1 ounce.

M. A soft jelly, to be used as an ointment or embrocation.

Against fissures of the nipple:

℞.—Biborate of Soda,	half a drachm to a drachm.
Purified Glycerine,	half an ounce.
Distilled Rose Water,	7½ ounces.

M. S. For lotions to the affected parts.

All these measures may be greatly assisted by the use of artificial nipples, which should be had recourse to whenever the child will submit to them. To overcome the repugnance which some evince for their employment, it is well to fill it with warm milk before applying it, so that the milk will flow readily into the mouth with the first suctions. The child soon becomes accustomed to it, for whilst emptying the artificial nipple, it forms a vacuum, and draws out the mother's milk gently. If the child can be prevailed on to accept it, the artificial nipple will almost always be sufficient of itself when the fissures and cavities are situated upon the free portion of the nipple, especially when the former are parallel with its length. Unfortunately, the case is very different when the fissures have a transverse direction, and especially when situated at the base. The artificial nipple, it is true, protects the natural one against the direct contact with the lips and tongue of the child, but is incapable, in the latter case, of preventing the separation of the edges of the wound.

If, notwithstanding all these precautions, nursing is so painful that the mother defers suckling too long, and there is danger of engorgement, pumps for extracting the milk artificially will have to be made use of. I should give preference to the one invented by M. Tier, and called *teterelle*, for its action is but slightly painful to the mother, and the lower chamber receives the milk, which may subsequently be given to the child. A new instrument, for the same purpose, was presented to the Academy of Sciences by Dr. Lampérière, of Versailles, but not having seen it operate, I am unqualified to judge of the many advantages claimed for it by the inventor.

Besides these altogether local lesions, there are some other accidents which may require nursing to be given up, either because they injure the milk or deteriorate the general health of the mother.

§ 3. Circumstances which may interfere with Nursing.

Whenever the mother suffers an attack of acute disease shortly after delivery, the secretion of milk is generally so far suspended as no longer to be sufficient for the wants of the child. The same is the case with some others, who, although apparently in good health, have no milk before the fifth or sixth day, without our being able to account for the delay.

Lastly, the strength of some women is so exhausted by a tedious labor, that it is indispensable to allow them two or three days of perfect rest. Under all these circumstances, the place of the colostrum must be supplied by a little sugar and water mixed with one-fourth the quantity of milk; and should the mother's recovery be postponed longer than three or four days, the child ought to be given temporarily to a wet-nurse, which were far preferable to artificial feeding.

Even when lactation has commenced regularly and properly, accidents are still liable to happen, all tending to lessen the quantity and injure the quality of the milk.

A. *Alterations in quantity.*—The quantity of milk may be altered in two ways, there may be too little of it or none at all, or there may be far more of it than the child requires. The former condition has received the name of *agalactia*, and the latter that of *galactorrhœa.*

Agalactia.—Nature seems to have left her work unfinished in some women, who, although capable of becoming mothers, are often unable to nurse their child on account of their having little or no milk. The agalactia may be either complete or partial: complete, when the secretion is absolutely wanting; and partial, when merely insufficient for the nourishment of the child. In both cases, it may be either original or accidental: original, when the breasts are the seat of no fluxion whatever after delivery, or when what secretion may take place is insufficient for the requirements of the child; secondary, when the milk, though abundant at the outset, lessens considerably in amount or even ceases to be secreted altogether.

It is very difficult to determine the causes of primitive agalactia. Imperfect development of the mammary gland, its atrophy, and the various diseases to which it is liable, may certainly occasion it in some instances. There are others, however, in which, unless we attribute it like M. Trousseau to deficient vital energy, due probably to imperfect development of the vessels supplying the gland, it is almost impossible to explain it. We have already studied the causes which may give rise to accidental agalactia, in the chapter on Lactation.

It is generally quite easy to ascertain the existence of complete agalactia; but when the nurse has any interest to practise deception, it is necessary to be very careful, if we would detect it when only partial. The first and best sign is the emaciation of the child, or, at least, its arrested development. On examination, the mother's breasts are found to be soft and flaccid, even when the child has not sucked for a long while. The latter is always hungry, and even putting it to the breast does not quiet its cries; it abandons the nipple at every instant, and sometimes even discards it angrily, as though enraged at finding nothing in it; finally, if after allowing it to suck for a long while, it is presented with a bottle of milk and sweetened water, it takes it with avidity.

When the absence of milk is due to an organic cause, all hope of re-establishing the secretion will have to be given up and the mixed method resorted to, or else the child committed to a wet-nurse altogether. But when it is accidental, and especially when it is the consequence of a violent moral emotion, of a slight indisposition, or an evanescent febrile movement, it will be necessary to rest satisfied with artificial nursing for a few days; and after the cause is removed, the gland may be excited by frequently putting the child to the breast.

I have very little confidence in the medicines or articles of food, which have long enjoyed a reputation for increasing the flow of milk. Still, we have the authority of Desormeaux in favor of anise, fennel, and lentils, which he asserts having known to increase the lacteal secretion in some of his patients.

Galactorrhœa, or the too abundant secretion of milk, presents two varieties which it is very important to distinguish. In the one, the milk retains all its properties; it is a mere hypersecretion, which ordinarily diminishes of itself after a time, and is only inconvenient to the mother and the child. The stream is so large and rapid as to give the latter no time to swallow, so that it is every moment threatened with suffocation; often, also, the milk escapes from both sides whilst the child is nursing and wets the mother. Sometimes, again, the breasts are so swollen as to be painful, and the mother is then obliged to use the breast-pump herself, or have it applied by another person.

In the other variety, the milk is clear, serous, and manifestly altered; it also flows passively and almost continually from the nipple. The latter variety is the only serious one. The poverty of the milk soon injures the child; but the mother, especially, suffers from this sort of *mammary diabetes*. Should it continue, general debility, loss of appetite, notwithstanding the almost constant feeling of need of food, a sensation of heat in the stomach and fauces, and pains and dragging sensations in the back and chest, soon make their appearance. Rather later, symptoms of the nurse's phthisis, as Morton called it, show themselves, and these unfortunates, feeble and emaciated, are quickly brought by hectic fever to an early death.

Weaning is the only means of preventing this fatal termination. The milk ceases to be secreted immediately afterward, and it then remains to restore the exhausted strength of the mother by the administration of iron, proper nourishment, and a residence in the country.

General deterioration of the mother's health.—The strength of some women who were well at the commencement of lactation, fails rapidly after a few months. They become more and more emaciated, lose their appetite, and may suffer all the consequences of galactorrhœa. In some cases, this altered state of health seems to affect injuriously both the quantity and quality of the milk; yet I have seen others, in which the increasing debility of the mother inspired serious apprehensions, although the child continued to thrive, as though she supplied it with good nourishment at the expense of her own exhaustion; and this fact they give as a reason for objecting to weaning. I am a very good nurse, say they, for my child thrives well. Whatever may be the condition of the child's health, when that of the mother is endangered by the continuance of nursing, it should be weaned at once, under the penalty of falling into consumption.

B. *Altered quality of the milk.* — M. Donné was the first to call particular attention to the changes which the nutritive elements of the milk are liable to undergo, and to the unfavorable effect which its poverty or richness, or its alteration by deleterious principles, might have upon the health of the child. I am indebted to him for the following details.

Unfavorable effect of a poor milk. — A milk poor in globules or cream, is watery, and not containing a proper amount of nutritive elements, affords insufficient nourishment for the development of the child: it is one of the commonest causes of poor success in nursing, and escapes observation the more easily, as it often coincides with a notable amount of the fluid, and, apparently, with the right kind of physical properties. This coincidence is far more unfortunate than when the poverty of the milk is accompanied by diminution in quantity; for, in the latter case, not only is the child imperfectly nourished, but a milk which is at once abundant and of inferior quality, fatigues the organs by keeping them engorged with a large amount of fluid.

The effect of the extreme richness of the milk is far more surprising; for at first it would seem as though this quality could hardly be otherwise than advantageous. Such, however, is far from being the case, for certain very delicate children are often inconvenienced by too substantial a food. Frequent vomiting, diarrhœa, and the affection called *crusta lactea* (impetigo capitis) often result from it.

Nothing short of microscopic examination, or the use of the lactoscope, can inform us in respect to the richness or poverty of the milk, and acquaint us with the true cause of numerous disorders or morbid conditions of the new-born child, which otherwise would remain inexplicable. The number, size, and regularity of the globules will establish the diagnosis in both cases.

Poverty of the milk, unless it is merely temporary, requires absolutely either the addition of a certain amount of cow's milk, or a change of nurse.

Its extreme richness may be remedied either by making the nurse's diet less substantial, or by occasionally giving the child a little sweetened water after each repast. M. Donné has profited by the experiments of M. Peligot, so far as to deduce from them some modifications of the plan of nursing, which it seems to me are likely to prove very useful.

It results from M. Peligot's analyses, that the milk becomes clearer and more watery the longer it remains in the breasts. He has shown that if the product of any one milking be divided into three parts, that is to say, all the milk that is given at once by a cow or she-ass, the first milk, which is certainly the longest secreted, is the most watery and the poorest; what comes next is richer, and the last is the best of all. The same has been proved to be the case with women whose milk is far more watery before than after suckling. From these facts, which are now well established, result the most important practical consequences. When, in fact, a child appears to be suffering from the richness of its mother's milk, all that is requisite is simply to leave a longer interval between its repasts, and not allow it to suck too long, that it may obtain each time a lighter milk, abounding less in nutritive matters; for on the one hand, the milk is weakened by allowing it to remain longer in the breast, and on the other, the child has time to digest better what it has already taken.

Alteration of the Milk by the elements of Colostrum.—The elements of the colostrum, which generally disappear a few days after the milk-fever, persist in some women indefinitely, and are discoverable in many others after a month, six weeks, and even several months, so that the milk never attains a state of entire purity. This alteration, which can be discovered only by the use of the microscope, is often a morbid condition, or at least results from a deranged state of secretion. It is, in fact, produced under the influence of general or local diseases affecting the nurse. Thus, whether they are taken with fever, or suffer from engorgement of the mammary gland, the characteristic granular corpuscles appear almost immediately.

The result of this alteration on the child is easily determined, as it produces all the effects of imperfect nutrition. "Never," says M. Donné, "have I met with it, without at the same time finding the children puny, sickly, and more or less affected with diarrhœa." A change of nurse is then absolutely indicated, unless, indeed, the alteration is due to an evanescent affection.

Admixture of Pus with the Milk.—Engorgements of the breast, whether spontaneous or consequent upon fissures and excoriations of the nipple, are exceedingly common with nursing women, and have a great tendency to end in suppuration. These abscesses, the history of which belongs to the pathology of the female, will claim our attention only in respect to the alterations of the milk which they are liable to produce. In reference to this, it is very important to distinguish from all others the parenchymatous abscesses seated in the tissue of the gland itself, and those which, commencing by a true lacteal engorgement, begin in a milk duct, whose walls, inflamed and distended into a sort of cyst, secrete pus. In these only can the pus become diffused in the milk. The superficial, or submammary abscesses, which do not open into the proper ducts, do not affect this fluid by admixture of pus, and alter its composition only by the reaction which a morbid condition of the kind exerts upon a neighboring organ.

When the glandular abscess is apparent, the presence of pus in the milk should be suspected, and nursing relinquished; but, as M. Donné remarks, it often happens that suppuration has taken place in some deep-seated parts of the gland, without being indicated by any external sign. The slowness with which the suppuration is accomplished, sufficiently explains this insidious course. Therefore, if the breast was affected at the outset with simple engorgement, attended with deep-seated lancinating pains, we should be on the watch, and subject the milk to microscopic examination. If it is impossible to make this examination, which is the only possible way of removing all uncertainty, prudence would dictate the relinquishment of nursing, for there seems to be no doubt that it would prove injurious to the child. The breasts should be emptied, if necessary, by the use of the pumps hitherto mentioned.

ARTICLE V.

OF MIXED NURSING.

It has been shown in the preceding pages that a great many women are incapable of affording a full supply of nourishment to their children. The constitution, health, and conformation of the breasts of some are all that could be desired; still their lactation is defective, either in quality, the milk being sufficiently abundant but too unsubstantial, or, what is more common, deficient in quantity, though of excellent quality. Others, on the contrary, have very good milk, but their feeble and delicate constitution excite fears lest a too free secretion and prolonged nursing should injure their future health. Lastly, there are some who, in the midst of conditions apparently the most favorable, find their milk fail, and even disappear very rapidly. To supply this deficiency, it becomes necessary to give the child other nourishment than what it is able to obtain from its mother's breast. This mixture constitutes precisely what is termed *mixed nursing*. It should be understood that I do not include in this appellation that system of nursing in which the child is kept from the mother at night, giving it diluted milk to drink, once or twice, for the purpose of enabling her to take what sleep her condition requires.

The indications presented by insufficiency of the mother's milk, vary according to the causes which produce it; they are also subject to the influence of a multitude of circumstances, foreign, it is true, to the question in its purely medical aspect, but which it is impossible not to take account of in practice.

There are women who, having no great desire to nurse, and alarmed at the sacrifices which the fulfilment of this duty involves, as also by the fatigues inseparable from it, consent to nurse their child only on account of the solicitation of their husbands or their family, and sometimes even by a sort of respect to humanity, but who would like nothing better than a good excuse for avoiding it altogether. With a little tact and experience, the physician is soon able to know just what to depend upon, and under these circumstances he ought not to hesitate, but, provided the position of the family is such as to permit of the employment of a wet-nurse, he should encourage the woman to give up the idea of suckling.

On the other hand, there are women who possess the maternal instinct even to jealousy, and who cannot become reconciled to the idea of allowing their children to be nursed by another. They are fully determined to run all risks before intrusting them with a hireling. A sentiment of this kind is certainly too laudable for the physician to pass over it lightly. Besides, the advantages which the little one derives from the attentive and affectionate cares lavished upon it by its mother, compensate for the imperfection of her milk. Nor do I see why in the majority of these cases there should be any impropriety in trying the mixed method, on the condition, however, of watching carefully over the child's health, and having recourse to another nurse as soon as it shall appear to suffer from it.

The same remark applies to young mothers whose condition in life does not permit them to take in a wet-nurse. Children removed from the parental abode incur too many unfavorable risks, and it is so rare to meet with women who, when free from all oversight, perform the immense duty which they accept, conscientiously, that I make no hesitation in preferring the mixed method to the removal of the child.

There are still some other circumstances which may render necessary the latter method of nursing. Thus, when a woman has been delivered of twins, it is very rarely that she will not be obliged to supply the deficiency of her lacteal secretion by artificial nursing. The same is the case when the mother is able to suckle from one side only; for, although it is strictly possible for a single breast to suffice, the co-operation of both is commonly necessary.

During the first days subsequent to birth, the child needs so little food that it will always find a sufficiency in its mother's breasts; and, except in cases where some circumstance or other prevents nursing, it were useless to give it anything else. Besides, this first milk possesses very useful properties, which might be interfered with by paps, or the milk of an animal. However, when the mixed method is decided upon, it should be commenced as soon as possible, for otherwise the child, having become accustomed to the breast, would be prevailed upon with great difficulty to take any other food. In the majority of cases, also, although there is a sufficiency of milk during the first week, there would soon be too little should the nursing be deferred. Cow's or goat's milk, given subject to the rules to be mentioned hereafter when treating of artificial nursing, are certainly the kinds of food best suited to the child, and the only ones that we recommend to be used for the first three or four months.

If the child is in a satisfactory condition, the paps, panadas, &c., mentioned in connection with weaning, may be given rather sooner than in the maternal nursing proper. The child, having been long accustomed to a rather more substantial nourishment than it derives from the mother's breast exclusively, may commence taking some farinaceous paps about the fourth or fifth month. It will be thus prepared for the weaning, which will probably have to be effected about the tenth or eleventh month.

The mixed method, thus understood, and continued for ten months or a year, is certainly preferable to a purely artificial nursing. I confess even, that when the mothers are obliged to send their children away, if committed at all to a wet-nurse, the absence of the parent's oversight is attended with so many inconveniences, that I prefer the mixed method to putting out to nurse. Could the mother only give it suck two or three times in the twenty-four hours, I would advise her to keep her child.

What has just been said applies also to women whose secretion of milk, although small in amount, is yet kept up regularly for nearly a year. But there are some who secrete abundantly during the early months, and then suddenly lose it altogether; in others the milk continues to be formed, but their health suffers so greatly from the fatigues of nursing, as to oblige them absolutely to give it up.

In both cases, the choice lies between an early weaning and the continuation of nursing by a wet-nurse—the mixed method being here out of the question. I begin by declaring that whenever the general health or the antecedents of the woman are such as to cause me to fear lest she should not be able to continue nursing longer than two or three months, I would advise her not to undertake a task beyond her powers. She would thus be spared one of the severest disappointments that a woman can suffer, namely, that of giving up her child to another, after nursing it for several months. But, whether because our advice is not followed, or that nursing by the mother has to be relinquished suddenly on account of some accident, ought the child to be raised by the bottle, or should it be supplied with a nurse? I am of Desormeaux's opinion, that artificial nursing is attended with far greater chance of success in the case of a child which has sucked for several months, than with one newly born; but experience has so often proved to me the great difficulties and inconveniences of artificial nursing in large cities, that I much prefer a nurse, even for a child four or five months old. I do all in my power to overcome the repugnance of the mother in reference thereto, and unless both herself and the child can go into the country to reside, I persist in my opinion.

Should the child, however, be strong and vigorous, if it is born of robust parents, if nothing but an accident has obliged the mother to suspend nursing, and if our views meet with great opposition, an attempt may be made to bring it up with the bottle, but still, on the condition of observing attentively its digestive functions, and having recourse to a nurse as soon as the necessity shall be manifest.

Before finishing what we have to say of the mixed method, we ought to insist upon the necessity of supplying the deficiency in the mother's milk by a species of food approaching the nearest to it in quality. We repeat, therefore, cow's milk, pure or diluted, according to the age of the child, and goat's milk, seem to us far preferable during the first four months. Paps and panadas, when given prematurely, may be successful under certain exceptional circumstances; but this success, which is constantly thrown up to us, cannot make us forget the disastrous effect which it has on some weak constitutions, and on many children in large cities. We repeat, therefore, that children born in the country of robust parents, and who are constantly exposed to the vivifying influence of the sun and fresh air, derive from the good hygienic conditions in which they live, a power of digestion which enables them to assimilate with advantage a food which would be indigestible for others.

ARTICLE VI.

SUCKLING BY NURSES.

Some women cannot, and others will not, nurse their children. Now, the latter should be subjected as little as possible to the bad effects of this incapacity or unwillingness; and the best substitute for the mother's milk is, certainly, that of a nurse.

§ 1. Of Choosing a Nurse.

The physician generally is, and always ought to be, charged with the selection of a nurse. Now, this choice is one of the most delicate and compromising acts of medical practice, for its conscientious performance necessitates precautions and investigations, which, to speak frankly, it is impossible to make in the majority of cases. To choose a nurse properly, is to guarantee the family a full supply of milk of good quality, and to assure them as to the excellence of her constitution, and especially that she is not *nor ever has been*, affected with any disease capable of being transmitted to the nursling.

Now, it must be acknowledged, that if an examination of the milk properly performed is capable of affording us a tolerably correct idea of its composition; if an investigation of the principal organs of the chest and abdomen, and the exploration of the mouth, teeth, and cervical, and even inguinal glands, are competent to assure us as to her good health; if the development of the muscles of the body and limbs, and the color of the skin, can enable us to appreciate the strength and vigor of the constitution, it is about all that we can expect to accomplish. To require a nurse to submit to a thorough examination of the genital parts and the use of the speculum, which is indispensable to a strict diagnosis, would be to receive an almost certain refusal. Perhaps some shameless women, or unfortunates, whom hunger allows to object to nothing, would not decline; but I am convinced that we should fail with those good and chaste country nurses, whose simple habits are foreign to the debasedness of cities. Such examination could be made obligatory only by public authority, and then by confining it to a single physician, who should be charged with the examination of all. These poor women would then have to submit to a single visit only. But it must not be forgotten that in Paris especially, before a woman is received by any one physician, she has often been presented to ten different families. She would, therefore, have been obliged to submit to the examination ten times. It is plain that this could not be done, or if it were, I would find it difficult to confide in one who had allowed it; for though I might feel satisfied as to her physical condition, I should certainly have strong doubts as to her moral qualities. Besides, would this examination always be so conclusive as to justify an absolute assurance to the families? Doubtless, we might be able, in the majority of cases, to certify that there does not exist, *at the time*, any symptom of syphilis; but is the present any security for the past? The local symptoms disappear, but does not the general infection remain, which may sooner or later become manifest? We see, therefore, that were the examination always possible, the evidences of a recent attack of syphilis might be overlooked, and could give us little or no information in respect to the antecedents. I coincide, therefore, with M. Donné, in the belief that the examination would be useful, and would even be disposed to direct the attention of the authorities to the propriety of causing a medical inspection of nurses; but in the present condition of things, I believe it impossible that each one should require this thorough examination.

After examining the chest, and ascertaining the absence of scrofulous cicatrices, the healthy condition of the cervical glands, and, if possible, of the inguinal glands, and after inspecting the development of the muscular system in order to appreciate the vigor of constitution, the physician should next give his attention to the milk, and the organs which secrete it. I confess regarding the color of the hair and soundness of the teeth as of minor importance; for blondes make as good nurses as brunettes, and, in some countries, the teeth are subject to early decay without the health of the inhabitants being any the less robust. Neither is it important that the nurse should be of the same age, stature, and temperament as the mother whose child is to be submitted to her charge. Without paying too much regard to attractiveness and beauty of external configuration, it is proper that there should be nothing unpleasant about the woman, and especially that she should be physically agreeable to the young mother. The latter is obliged to live for a year or eighteen months almost constantly in the presence of her child's nurse, and it is far from immaterial whether she is to be in continual relation with a repulsive countenance. Much consideration should be had for whatever information is attainable in respect to her intelligence, character, and general disposition. A nurse who is gentle, good-natured, and who knows how to amuse a child, ought, other things being equal, to be preferred. It were useless to remark, that no woman should be introduced into a family of whose probity and morality there can be the least doubt: unfortunately, however, we are too commonly obliged to trust to chance in regard to the latter point.[1]

The nurse's age is not a matter of indifference. I think it better to choose one between the ages of twenty and thirty years; and would advise declining all who are over thirty-five. As a general rule, women who have already had several children, and who are consequently familiar with all the offices which they require, are received more willingly than primiparæ. It is far better that an inexperienced mother should have an experienced nurse, who is accustomed to handle and take charge of children. Besides, by inquiring of families where they have already nursed, we may have more certain information as regards their disposition, their honesty, and the amount and quality of their milk in a previous nursing, which may serve, to a certain extent, as a guarantee for the future. Finally, they are much less affected by putting away their own child than primiparæ, and, therefore, are far less likely to lose their milk suddenly. The former have, therefore, undoubted advantages over the latter, but they are also liable to some objections: thus, they have acquired habits which they relinquish with difficulty; it is much harder to subject them to the regimen which you wish them to follow; lastly, provided they do not find in their new position the pecuniary advantages, the indulgences and attentions of which some parents are lavish, they make unfavorable comparisons, and become discontented and exacting.

---

[1] It were better, as a general rule, not to engage nurses too long in advance. I think it prudent to reserve the right of examination at the time when they shall be needed; for there are cases in abundance, in which, notwithstanding the most favorable appearances, the lactation is defective. For a still stronger reason would it be wrong in parents to retain a pregnant woman without consulting their physician, because she had already nursed for one of their acquaintances, who had recommended her highly. So many circumstances are liable to interfere with lactation, and so many accidents may happen after delivery capable of seriously injuring a health which had been perfectly good up to that time, that I advise all my patients never to treat with their nurses otherwise than provisionally, and to promise only conditionally, and always subject to the final recommendation of their physician. Disregard to this limitation has given rise to many unpleasant occurrences in families.

The woman who offers herself as a nurse may be still pregnant, or have been delivered for some time.

If she is still pregnant, it is important to be sure, in the first place, that her labor will be over at least two months before that of the mother of the child. The organs have hardly returned to their normal condition, and the woman is barely recovered before two months after delivery, and not before then ought she to be intrusted with a new nursling. Earlier than this, the new-born child would have a milk better adapted to its digestive powers; but a woman is liable to so many accidents during the first six weeks after delivery, that it is impossible to answer for the future.

It is much more difficult to judge of the future qualities of a nurse during pregnancy, and whatever may be the result of a first examination, it is necessary to be very cautious as to what one says in regard to it.

We have already noticed the points of useful information to be ascertained by an examination of the colostrum secreted during the latter months of gestation, and we shall not recur to the subject; it is almost the only element of importance in the question under consideration. The form and size of the breasts are of but secondary value.

Voluminous breasts are by no means a certain indication of a full supply of milk in the future; for generally the entire mass is in great part made up of fat. This remark does not always apply to the size of the gland itself, which can often be distinguished from the thick layers surrounding it. It is important, in fact, that it should not be too small. But, provided it is of about the normal size, the flow of milk may be sufficient or even abundant if the veins of the breast are largely developed.

Dealers in cows, says M. Trousseau, know very well that their milking qualities cannot be judged of by the size of the udder. Thus, a cow whose udder has a cubic capacity of four quarts may give ten quarts of milk, being six quarts more than the apparent size, which proves that milk is secreted during the act of sucking or of milking. The same is the case in the human species; the size of the breast is not an absolute indication of good nursing qualities.

M. Trousseau thinks that very important information may be derived from the phenomena observed in the breasts of certain women at each menstrual period. When, says he, there is a strong determination to the breasts at each period, when the latter grow hard and painful, and the globules of the gland become more distinct and form projections, the woman is likely to be a good nurse. . . . I have never had an opportunity of testing the value of this conclusion.

When the woman has been delivered and nursed for some time, the physician ought to direct his attention especially to the amount and quality of the milk. I shall not revert to the means for determining the richness or poverty of the milk, its purity, or its alteration by heterogeneous elements. I would, however, remark, that to have ascertained, by placing a few drops of milk in a spoon, that it is opaque, homogeneous, of medium consistency, and without any peculiar taste or odor, does not obviate the necessity of having recourse to the microscope whenever possible. By it alone can be estimated the number, regularity, and size of the globules, and, consequently, the amount of cream or buttery part which they constitute. Unfortunately, but few physicians have this instrument at their disposal or know how to use it; and still less are they accustomed to chemical analysis. In ordinary cases, and in the absence of a better process, the richness of the milk may be estimated by measuring the thickness of the layer of cream; for this purpose, M. Donné's little graduated test-tubes may be used, or, still better, the lactoscope of the same author, whose application requires but a few minutes.

It is important to bear in mind the variations in the milk pointed out by M. Peligot according to the time it has remained in the breasts (see page 1091). If a woman presents herself with breasts much distended, it is necessary that she should allow her child to suck for some time, before we shall be able to form a correct idea of the density of the milk; for the first milk is much thinner and more watery than that which is secreted a short time before its extraction.

Lastly, the best means of judging of the quantity of milk, is to examine the physical condition of the nurse's child; to be certain, as far as possible, that it takes no other food; to witness it suck several times, and determine whether its appetite seems satisfied, although the breasts still retain a considerable degree of firmness. Again, like M. Natalis Guillot, we may cause the child to be weighed before and after putting to the breast; the quantity of milk swallowed being indicated by the difference in weight. From 2½ to 5 or 6 ounces should be withdrawn at each suckling; but less than 2½ ounces is insufficient for the purposes of nutrition.

The complete absence of glandular engorgement should lead us to suppose that the milk is uncontaminated with a single globule of pus; but if the condition of the breast is such as to leave any doubt in the mind, nothing but microscopic examination is capable of settling the question. This instrument is still more necessary for ascertaining the presence of the elements of colostrum at a period when they ought to have disappeared altogether.

Lastly, the age of the milk should be taken into serious consideration: As we are obliged to allow the nurse at least two months for the purpose of recovering from the fatigues of labor, the accoucheur cannot supply the child with a very young milk, such, for instance, as its mother might furnish it; but it is at least better not to give it milk from a nurse who has been delivered longer than from eight to ten months. At this time, it is no longer adapted to the requirements of the child, and as most women are barely able to nurse longer than from eighteen to twenty months, there would be some risk of finding the secretion cease altogether, before the natural period of weaning. A milk of from two to six months should therefore be preferred.

Women who have nursed for a year or fifteen months, and desire to take charge of another child, say that a young infant restores the milk, but the responsibility of the assertion must be left with the good women themselves.

Most of the precepts which we have laid down for natural nursing are entirely applicable to wet-nursing; there are, however, some peculiarities which it is proper to indicate.

§ 2. Of the Regulation of Wet-nursing.

At what time ought the nurse to give the breast to a new-born child?—A nurse who has been delivered for three or four months, is, at the outset, incapable of providing the young infant with as suitable a nourishment as it would have derived from the mother's breast. The colostrum secreted by the mammæ of a recently delivered female, is not merely a food, but possesses laxative properties eminently adapted to the expulsion of the meconium. Though slightly charged with nutritive matters at first, this colostrum is perfectly suited to the digestive powers of the new-born child; for to load its stomach with anything more substantial, would expose it to imperfect elaboration and all its unfortunate consequences. Struck with these inconveniences, some practitioners advise the mother to begin suckling for the first few days, and not to give the child to the nurse until it is better able to digest her milk. Besides, say they, it is not only for the interest of the child, but of the mother also, for the secretion of milk is a natural emunctory, well adapted by the sort of derivation it occasions to lessen the tendency to the various inflammations to which lying-in women are so frequently exposed.

I cannot accept this view. If we regard only the interests of the child, there can be no doubt that the lactescent serosity furnished by the breasts at the outset, is the kind of nourishment best adapted to its condition, and that in this respect, the milk of a nurse of three or four months would be less suitable; but we shall see how easily the too great density of the latter kind of milk may be remedied by a sort of mixed nursing, and daily observation proves, that with such precaution the health of the child is in no wise endangered. Now, a nursing once begun, and suddenly interrupted after four or five days, is far from being devoid of danger and inconvenience to the mother. The fact is, that women suffer the most from nursing at the outset. Then it is that fissures and cracks of the nipple, lacteal engorgements, and inflammation and abscesses of the breast, make their appearance. That a female who is determined to nurse should brave all these dangers may be easily understood, for she is sufficiently compensated by the fulfilment of a grateful duty; but that one who cannot nurse should expose herself to them unnecessarily, is incomprehensible, unless we suppose her willing to add to the painful sacrifice which the giving up of her child to a wet-nurse imposes upon her. Besides, we must not believe, as some physicians do, that nursing protects women from puerperal diseases. We have but too often occasion to know from experience in our hospitals, that puerperal fever, for example, attacks with equal violence those who nurse and those who do not.

In civil practice, where the minutest attentions are bestowed upon the child, I can discover but few advantages for it, and many inconveniences for the mother, in beginning to nurse, when she has no expectation of continuing to do so. The case is different in our large lying-in hospitals. However carefully conducted, it has never yet been possible to provide a supply of nurses equal to the demands of all the children. In the clinic of the Faculty, for example, there are but five or six nurses for twenty children, and the number of ordinary or ward nurses being too small to give the little unfortunates the most necessary attentions, a great number perish, we are bound to acknowledge, of cold and hunger. Under these circumstances, the physician is perfectly right in requiring the mother to suckle her child until it can be provided with a nurse.

For the first twenty-four hours after birth, the child will take nothing but a little sweetened water as a substitute for the colostrum; and if it should seem difficult to expel the meconium, a few spoonfuls of compound syrup of chicory may be administered. By this time, the bowels will be sufficiently emptied, and it may be put to the breast. But for the first five or six days, or rather longer if the child is feeble, it will not depend exclusively upon the nurse's milk, but the latter is to be alternated with sweetened water during the first three or four days; after the fifth or sixth, it will be allowed to suck for a short time, and the nursing be immediately followed by the administration of a few dessert-spoonfuls of sugar and water; lastly, about the tenth day, it will be confined to the breast altogether.

The new-born child is rarely able to take enough milk to empty the nurse's breasts; therefore, it is well to keep her own child near her for some days, in order to avoid extreme distention of the mammæ. She ought then to be advised to give the first milk to the nursling. If separated from her child, she should endeavor to decrease the flow of milk by a very moderate diet and diluent drinks; and if, notwithstanding these precautions, the breasts become painful, they must be emptied by a breast-pump.

The precautions which it is necessary for the mother to observe, are not required in the case of a robust nurse who is accustomed to fatigue, and she is expected to give the child suck during the night. Upon the whole, the precepts in regard to the regulation of the repasts, are as applicable here as to nursing by the mother.

Some nurses are in the habit of taking the child to bed with them. This ought to be positively prohibited, as terrible accidents might result from it. Several times it has been the lot of nurses to find only a dead body upon waking, from having suffocated the child whilst asleep. The best means of being certain that the child shall be laid in its cradle after nursing, is to give the nurse so narrow a bed as to make it almost impossible for her to sleep with the child beside her

§ 3. Regimen of Nurses.

The diet of nurses should be moderate but substantial. The latter quality ought not, however, to be so far insisted upon as to give them a food which is too succulent and too rich in azotized matters. They should certainly partake of a certain amount of meat, but it would be improper to confine them exclusively to it. Being accustomed from childhood to indulge freely in vegetables, they would not long support a merely animal diet without disadvantage.

Nurses brought up in the country often suffer from confinement to the house in cities, and their condition is still further aggravated by the indolence which takes the place of their previous active habits. Therefore, after the first few days, they ought, if possible, to be employed in some light household duties, and, even when the child is unable to accompany them, they should be made to take exercise out of doors.

The nurse may at any time lose her milk, be attacked by an acute disease, or be affected by some occurrence which lessens or alters the secretion. It is a painful thing to most families to have to change their nurse, and it is important to console them with the assurance, that the change is not so serious a matter as is generally represented. Provided the child receives a milk of good quality and enough of it, it will suffer nothing in this respect. Therefore, all that we have to do, is to choose a milk equal to, if not better, than what it has been deprived of. Under these circumstances, the change is a matter of such indifference, that when the nurse's disposition is too disagreeable, or if she does not take proper care of the child, I do not hesitate, whatever the qualities of her milk may be, to advise a change.

The only precaution to be observed is, that when once decided upon, she should not be informed of the project until another one is engaged to replace her.

The only difficulty is to get the child to take the breast of a new nurse. If it has attained the age of from six to eight months, it often manifests a great repugnance thereto. It should then be left for some time without nursing, and advantage be taken of the night or a dark place, to put it to the breast for the first time.

ARTICLE VII.

NURSING BY AN ANIMAL.

Nursing by a female animal constitutes the transition, so to speak, between wet-nursing and artificial nursing. Though much in vogue in some countries, it is rarely had recourse to in Paris or most of the departments. We hardly ever recommend it, except when a child who has been weaned for a long time becomes suddenly ill and requires a diet composed exclusively of milk, and in certain special circumstances making it necessary to administer to the child a milk which has been rendered medicinal. By causing animals to swallow various remedies, such as mercury, iodine, and iron, their milk becomes imbued with most of the properties of these substances. It would be unjustifiable to subject a healthy nurse to a treatment of this kind for the benefit of the child, as it might readily prove injurious to her.

The animals made use of are goats, sheep, she-asses, and cows; but most frequently the she-goat. The shape and size of the teats, which are easily seized by the child, the abundance and quality of its milk, the docility of the animal, the ease with which it is trained to give suck to the child, and the attachment which it is capable of forming for it, are sufficient reasons for the preference. That species should be preferred which is destitute of horns and which have long, thick, and white hair, because they possess the hircine odor in a slighter degree. A young goat which has nursed several times, and given birth recently to her kid, ought to be preferred.

This mode of nursing, says Desormeaux, requires at the outset much care and attention as respects the presentation of the mamma to the child. The petulance and impatience of the animal expose it to frequent accidents, but after a time the goat comes of its own accord to give it suck. The infant should be laid in a low cradle placed upon the floor.

When it is desired to communicate medicinal properties to the milk, they are made to take internally or to absorb by the skin the active principles of these medicines. Thus, mercurial ointment is rubbed into the skin of goats in order to communicate antisyphilitic properties to the milk.

ARTICLE VIII.

ARTIFICIAL NURSING.

I have but little to say of artificial nursing; for it is admitted by all to be the worst of the various methods proposed for nourishing a child. In large cities, where it is a difficult matter to procure good milk, and where the bad health of the cows renders useless all the precautions taken with this object, most of the unfortunate children subjected to this regimen die within the year. In the country, however, the chances are far more in favor of artificial nursing; for there it is possible to be almost certain as to the health of the animal, the food it takes, and the good qualities of its milk. Besides, the excellent atmospheric conditions in which the child is placed, compensate, to a certain extent, for the imperfection of the mode of alimentation. Although a woman's milk is always preferable to any other, the artificial nursing, which I proscribe unconditionally for large cities, may be tolerated in the country, with the understanding, however, that it shall be pursued with intelligence.

Cow's milk is generally employed, but its administration demands some precautions. Being too rich for a new-born child, it requires to be diluted with pure water, barley water, a decoction of crumbs of bread, of rice slightly sweetened, or gruel. Pure water should, I think, be preferred in most cases, and the proportions of the mixture must necessarily vary with the age and digestive powers of the child. During the first week, three parts of water should be added to one part of cow's milk, and during the early months the latter should be diluted one-half; after which, unless the digestion is feeble, but one-fourth of water may be added until the sixth month, when the milk may be given pure.

Desormeaux advises, when the children are feeble, that the milk be diluted with chicken-water, or a fluid containing animal matter. I have seen some, says he, whose stomachs were better suited by weak decoctions of meat than by milk, and I am convinced by a multitude of practical observations that the matters ingested irritate less in consequence of their being azotized, than because they are digested with difficulty. I think this regimen proper after the sixth month, but would not advise it in the earlier months, when, if used at all, it should be with great caution.

It is well to sweeten slightly the children's drink. Although sugar has not the heating qualities which the women attribute to it, it must be used moderately, for it is not always digested easily. I have seen, says Desormeaux, feeble children throw up unchanged the sweetened water and solutions of gum and starch which had been given them as drink.

The drinks ought to be rather more than lukewarm. When pure milk is used, it should be brought by the water-bath to the temperature it would have had if just drawn from the cow; if, on the contrary, it is to be diluted, only the fluid to be mixed with it should be heated. In no case ought the milk to be boiled; for ebullition deprives it of a part of its aroma, and of the air which renders it more digestible.

The mixture of milk with one of the above-mentioned substances soon ferments and spoils, especially in summer, or in warm rooms in winter. It ought, therefore, to be prepared only when about to be administered.

We have before stated that a child, whose alimentary canal has been habituated by mixed nursing to more substantial nourishment than the mother's milk, is able to take paps and solid food rather sooner than it otherwise would. The same is true after artificial nursing. There is no occasion to revert to the precautions laid down in the article on Weaning.

The instruments used for giving children drink are numerous. The spoon and drinking-cups, by whose assistance the milk is poured into the mouth, are subject to some inconveniences; so that, unless they are unable to suck at all, I prefer the nursing-bottle as most nearly affording the conditions of natural nursing. It can be readily procured everywhere, and were it on that account alone, it deserves to be mentioned. It is either an ordinary four-ounce medicine vial or one of those small flattened bottles used by wine merchants for exhibiting their specimens; into the neck is introduced a sponge cut for the purpose, and which projects about an inch and a half beyond it; the whole is covered with a piece of muslin, and fastened by a thread. The thread ought also to be drawn with a moderate degree of tightness around the sponge at its exit from the bottle, so as to compress it, and prevent the milk from flowing too rapidly. Care should be taken to keep the sponge, muslin, and thread, always in fresh clean water, and before using, pass a little milk through it and squeeze, so as to drive out the cold water, and replace it by warm milk.

With all these precautions, this bottle has still more imperfections, which many instrument-makers have sought to avoid. The nursing-bottle manufactured by M. Charrière, I think merits special recommendation.

In terminating this chapter, I cannot recommend too highly to physicians a little work by Dr. Donné, which, under the modest title of *Advice to Mothers*, will furnish them with an abundance of useful hints in relation to the education of children.

CHAPTER III.

GENERAL CONSIDERATIONS ON CERTAIN POINTS RELATING TO INFANTILE HYGIENE.

1. *Of Clothing.*—The clothes of the new-born child should be so loose as not to obstruct its motions. The swaddling-clothes, which are still in general use, and which were formerly drawn much too tight, may be retained, but only on the condition of leaving sufficient freedom of motion to the limbs of the child. I confess that, for the first weeks, they seem to me to have some advantages over what is called the *English style*, by protecting the children better from the cold, especially when they are wet with urine, and also by affording greater facilities to those who have to take them up and carry them about. I therefore approve of swaddling, but would have the clothes so loose as to allow the extremities, the lower ones especially, sufficient freedom of motion.

After the umbilical cord has fallen off, a folded compress, as large as a silver dollar, should be applied upon the navel, and kept in place by a moderately drawn circular bandage. It serves to prevent the rubbing, and consequent irritation of the umbilical cicatrix, and perhaps, also, the formation of a hernia.

Pins should be used as little as possible in dressing the child. They may become loose, and, by sticking it, give rise to serious accidents, such as convulsions and death.

It is important, also, that the little cap string or ribbon, which passes under the jaw, should be sufficiently loose, for the cap is liable to be displaced, and the neck might be subjected to constriction. To avoid this, the string should be attached to one end of a band, the other end of which is fastened in front of the chest.

After the second or third month, the swaddling-clothes should be replaced by long dresses; from this time the style of garment is subject to the fancy of the parents, and, provided the child is protected from the cold and sufficiently at its ease, the physician need concern himself no further about it.

2. *Of Washing, Bathing, and Cleanliness.*—Perfect cleanliness is indispensable to the health of children, and nurses cannot be watched too closely for the purpose of preventing their allowing them to remain in their urine or fecal matters; they should be changed as soon as they become soiled. They ought to be washed with warm water, and not merely wiped, as is done by some nurses. It is difficult to do otherwise when out walking; but the omission should be supplied immediately on reaching home. In some countries, cold water is used in these washings; I think, however, that it is rather hazardous within the first year, and I do not recommend it before the child is eighteen months or two years of age.

I am in the habit of directing the children to be bathed every other day; but when they seem to be rather more fatigued and enervated on the day of the bath, I advise it to be performed but twice a week, and am content with a simple immersion, or washing all over, every morning. The temperature of the water should be from 77° to 86° F. The bathing ought to be short in proportion to the fatigue of the child, but, as a general rule, it ought not to be longer than five minutes in the first month, and rarely ten minutes in the subsequent ones. When the children are restless at night, and sleep little or badly, it is a good plan to bathe them in the evening before going to bed. When the restlessness and insomnia are very great, I have used with advantage a bath prepared with a decoction of lettuce-leaves.

In winter, or when the weather is cold and damp, it is important not to allow the child to go out for several hours after bathing.

Some persons are afraid to wash the child's head, yet it should be done, in order to remove the scurf which forms there, and to prevent the formation of the crusts which some persons are glad to see appear. When they are already formed, they ought not to be respected, but after rubbing the head gently with a warm cloth, they may be removed by a soft brush. If this is not sufficient, the head may be greased, and the next morning they will be found to come off readily.

3. *Taking the air, walking.*—The child should be placed, immediately after its birth, in a large, airy chamber, kept for the first week at a rather elevated temperature. If the child is weak or born prematurely, it is important, in winter, to surround it with bottles of warm water: one at its feet, and one at each side. The head of the cradle should be turned towards the windows, in order to protect the child's eyes from the too bright light. The omission of this precaution has seemed to me to favor the development of purulent ophthalmia.

In winter, especially, the children should not be taken out before the fifteenth day. During the intense heats of summer, this rule need not be adhered to so strictly, provided they are strong and well. But after the first going out, they should be promenaded every day for several hours, and at three months, they ought to remain for the greater part of the day exposed to the air; in winter, autumn, and spring, they will be kept out for at least three or four hours. The air and sun are almost as necessary as good nourishment, and it is perfectly useless to consult barometer and thermometer to know whether it is proper for a child to go out. Even in the worst days, a favorable hour can always be found and made available; only when it is cold and freezing, the walk will be shortened. There is no occasion to fear disturbing their sleep whilst promenading, for they never sleep more soundly than then.

Of latter time, some philanthropic physicians, at the head of whom I am pleased to name my colleague and friend, M. Loir, have insisted strongly that the recording of births should be done at home, and that there should be no obligation to carry the poor children at every season to the mayoralty within the first three days. This law has fallen into neglect in most of the provinces; but in Paris it is still observed quite rigorously, unless that the accoucheur certifies that the child is in poor health, and that it is impossible to transport it thither. I am happy to unite my feeble voice with those of my colleagues, to solicit from the authorities a modification of the existing laws. The same motives of humanity induce me to express the desire that Catholic families should cause their children to be baptized at home, unless the ceremony be put off to a somewhat remote period from birth. Undoubted advantages would result from it as respects both mother and child.

4. *Of Sleep.*—For the first days subsequent to birth, children do nothing but suck and sleep. Whilst asleep, they should be laid upon the side—sometimes upon one and sometimes upon the other, in order to avoid bad habits. At first, they almost always fall asleep whilst suckling, so that it is nearly impossible to lay them awake in the cradle; but rather later, care should be taken not to allow them to go to sleep in the arms or on the lap. Having once acquired this habit, it becomes a necessity; and on awakening at night, they will not go to sleep again except in their nurse's arms. They ought to be put in the cradle whilst awake, and allowed to go to sleep there; for when once allowed to acquire bad habits in this respect, it is very difficult to break them. It requires great firmness to hear them cry for a long time; but with courage and perseverance, and by a temporary removal of the nurses, of whose weakness they are aware, a complete reform is finally obtained. The same remarks apply to the habit which some nurses have of rocking children.

Most children at the breast sleep during the day until they are twenty months or two years old. This sleep, which is almost constant at the outset, becomes shorter and less frequent as they advance in age; but it is very rare for them not to take three or four hours of sleep daily during this early period of life. This repose is, therefore, a necessity, but there is no occasion to avoid the least sound for fear of wakening them, as they very readily become accustomed to sleeping in the midst of motion and noise; some children sleep but lightly, because they have always been accustomed to solitude and silence. Though it is well not to be too scrupulous in this matter, they ought not to be awakened too suddenly for fear of alarming them.

5. *Exercise.*—The only exercise of new-born children consists in slight motions of their arms and legs, which, as we have said, ought not to be confined too closely. Rather later, they may be moved about in the arms; toward the fifth or sixth month, they may be exercised in standing on a carpet or coverlet, and left to themselves in order to try their strength; they begin first to drag themselves, then to creep on all fours, and soon get up by taking hold of furniture; after which they make a few steps. As a general rule, I do not think it advisable to encourage children to walk too soon by supporting them with belts of listing, wagons, &c.; we ought always to await the first promptings of nature.

INDEX.

A.

- Abdomen, skin of, altered by pregnancy, 154.
  - enlargement of, as sign of pregnancy, 240.
  - palpation of, 247.
  - smallness of cavity of, induction of premature labor for, 1006.
- Abdominal pains during pregnancy, 520.
  - muscles, effect of contraction of, during labor, 612.
    - effect of paralysis of, during labor, 613.
- Abortion 560.
  - spontaneous, 561.
    - causes of, 561.
      - due to the father, 562.
        - mother, 562.
      - due to diseases of the womb and its appendages, 563.
      - due to diseases of the ovum, 564.
      - due to disease and death of fœtus, 565.
  - accidental, causes of, 566.
    - symptoms of, 567.
    - diagnosis, 571.
    - delivery of after-birth, 575.
    - prognosis, 578.
    - treatment, 579.
    - retention of placenta in cases of, 577.
  - causes on account of which it is artificially produced, 567.
  - production of, 1022.
    - reasons for, 1023
    - mode of operating, 1024.
    - by detachment of membranes, 1024.
    - by puncture of the ovum, 1025.
- Abscesses in the lips of the cervix uteri, 704.
- Acute diseases, induction of premature labor for, 1007.
- After-birth, natural delivery of the, 381.
  - artificial delivery of the, 868.
  - delivery of, in cases of abortion, 575.
  - accidents that may complicate its delivery, 884.
- After-pains, 429.
- Agalactia, 1089.
- Agglutination of the external uterine orifice, 696.
- Albuminuria during pregnancy, 490.
  - frequency of œdema from, 496.
  - time of commencement, 496.
  - nervous disorders from, 496, 499.
  - progress of, 497.
  - prognosis of, 497.
  - a cause of abortion, 498.
    - various obscure disorders, 498.
  - treatment of, 498.
  - as a cause of eclampsia, 792.
- Albuminous urine, mode of testing, 494.
- Allantoid, the, 186.
  - vesicle, 187.
- Amaurosis during pregnancy, 508.
- Amnion, the, 184, 190.
  - waters of the, 184, 191.
  - dropsy of the, 541.
    - prognosis, 543.
    - treatment, 544.
- Amniotic fluid, 184.
  - fœtor of the, 400.
- Amputation of limbs of the fœtus, 557.
  - the thigh, effect of, upon labor, 613.
- Anæsthetics use of, in obstetrical practice, 915.
  - effect of, on the uterine contraction, 917.
    - abdominal muscles, 919.
    - resistance of the perineum, 919.
    - mother's health, 920.
    - life and health of the fœtus, 923.
  - use of, in eclampsia, 814, 817.
  - indications for the use of, 923.

Anæsthetics, use of, in obstetrical operations, 925.
  during pregnancy, 925.
  for convulsions during pregnancy, 925.
  whilst nursing, 926.
  mode of administering, 926.
  in pelvic version, 948.
Anchylosis of the fœtal articulations, 862.
Aneurism during labor, 825.
Anhistous membrane, 170.
Anorexia during pregnancy, 463.
Anteversion of the uterus during pregnancy, 539.
Aorta, compression of, for uterine hemorrhage, 892.
Apòplexy and asphyxia of new-born children, 409.
  of the placenta, 554, 765.
  placental, 765.
  puerperal, 790.
Areola the, 115.
  changes in, from pregnancy, 155.
  changes of, as a sign of pregnancy, 241.
Artery, omphalo-mesenteric, 189.
Articulation, sacro-coccygeal, 42.
Ascites during pregnancy, 502.
  prognosis, 503.
  treatment, 504.
  of fœtus, 858.
Asthma during labor, 825.
Attentions to the woman during labor, 388.
  child during labor, 399.
  woman immediately after delivery, 405.
  child immediately after delivery, 406.
  lying-in woman, 439.
Auscultation, as applied to pregnancy, 252.
  in vertex presentations, 316.
  face presentations, 336.
  breech presentations, 349.

B.

Bag of waters, the, 294.
  double, 294.
Ballottement, 245.
Battledoor-placenta, 210.
Bellows murmur as a sign of pregnancy, 253.
Bile, secretion of, in the fœtus, 237.
Bladder, displacements of, during pregnancy, 153.
  rupture of, during labor, 393.
  symptoms, 393.
  paralysis of, after labor, 439.
  distention of, during labor, 393.
  tumors of, 726.
  procidentia of, 726.
  cancer of, 726.
  lateral displacement of, 730.
  distention of, as a cause of convulsions, 795.
Blastodermic membrane, formation of, 182.
Blood, changes in, from pregnancy, 157.
  alterations of, during pregnancy, 479.
  as a cause of convulsions, 794.
  secondary hemorrhage, 900.
Blood-letting and debilitating regimen, effect of, on the development of the child, 911.
Blot's perforator, 1041.
Bodies of Rosenmüller, 82.
Botal, foramen of, 212, 231.
Branchial fissures, 213, 229.
Breasts, the, 115.
  anomalies of, 115.
  changes in, during pregnancy, 155.
Breech presentation, 347.
Broad ligaments, 82.
  cysts of, 83.

C.

Cæsarean operation, 1030.
  history of, 1030.
  on the living female, 1031.
  post-mortem, 1039.
  mortality of, 1031.
  indications for, 1032.
  compared with embryotomy, 1032.
  propriety of, as influenced by the duration of the labor, 1035.
  propriety of, as influenced by the rupture of the membranes, 1035.
  preparatory measures, 1036.
  mode of performance, 1036.
  dressing of the wound, 1037.
  vaginal, 1038.
Calculi, urinary, 727.
Callipers, Baudelocque's, 654.
Canal of Nuck, 84.
Cancer of the neck of the uterus, 711.
  rectum, 726.
  bladder, 726.
Caput succedaneum, 334, 852.
Carunculæ myrtiformes, 63.
Catheter, mode of introducing, 61.
Caul, the, 296.
Cauliflower tumors of the cervix uteri, 710.
Cephalalgia during pregnancy, 507.
  from uterine hemorrhage, 771.
Cephalic version, 929.
Cephalotripsy, 1045.
  repeated, without traction, 1053.
  pelvic version after, 1053.

Cephalotripsy, after delivery of the trunk, 1053.
  objections to, 1054.
  statistics of, 1054.
Cephalotribe forceps, 1045.
  Cazeaux's modification, 1046.
  Chailly's do., 1047.
  Depaul's do., 1047.
  Blot's do., 1047.
  Locarelli's do., 1048.
  Hüter's, Scanzoni's, and Braun's do., 1048.
  effect of, on the diameters of the head, 1048.
  crushing power of, 1048.
  limits of applicability, 1048.
  mode of using, 1050.
  difficulties in the use of, 1050.
Child, healthy, management of, 406.
  diseased or feeble, management of, 409.
  attentions to, immediately after birth, 406.
  debility of, 409.
  apparent death of, 409.
    treatment, 416.
  lesions of respiration of, 412.
    circulation of, 414.
    nervous centres of, 414.
Child, effect of bleeding and debilitating regimen on its development, 911.
Children, hygiene of, from birth until weaning, 1062.
  clothing of, 1104.
  washing, bathing, and cleanliness of, 1105.
  out-door exercise of, 1106.
  sleep of, 1106.
  exercise of, 1107.
Chlorosis during pregnancy, 455.
Chloasma, 513.
Chloroform, use of, in eclampsia, 814, 817.
Chorion, composition and formation of, 193.
  villi of, 202.
  dropsy of the villi of, 547.
Circulation, changes in, from pregnancy, 157.
  of fœtus, 231.
  changes in, after birth, 238.
  lesions of, during pregnancy, 479.
Clitoris, the, 60.
Coagulum in uterus, as cause of secondary hemorrhage, 899.
Coccyx, the, 36.
Colostrum, 435, 1062.
  characters of, 1062.
  time of continuance of, 1063.
  contamination of milk by, 1092.
Colpeurynter, 1010.
Conception, 119.
Congenital hernia, 207.
Constipation after delivery, 440.
  during pregnancy, 477.
Convulsions, puerperal, 788.
Cord, umbilical, prolapsus of, 828.
  great length of, 834.
  shortness of, 834.
  constriction of neck of child by, 834.
  encircling of body of child by, 835.
  short, diagnosis of, 835.
    treatment of, 838.
Corpora lutea, 96.
  cause of color of, 98.
  as a sign of pregnancy, 99.
Coxal bone, 37.
Cranioclasm, 1054.
Cranioclast, Simpson's, 1054.
  description of, 1054.
  mode of using, 1054.
  advantages of, 1055.
Craniotome, 1042.
Craniotomy, 1041.
  mode of perforating the cranium, 1043.
  advantages of, 1044.
  in mento-posterior positions of the face, 848.
Crotchet, the, 1044.
Cystocele, 729,

D.

Deafness during pregnancy, 508.
Decapitation of the fœtus, 1059.
Decidua, 167.
  old theory of the, 167.
  reflexa, 168.
  uterine, 168.
  inter-utero placental, 167.
  serotina, 169.
  present theory of the, 171.
  structure of the, 172.
  description of the three portions of, 175.
  at the end of gestation, 177.
Deformities of the pelvis, 616.
Delivery, forcible, *post-mortem*, 1039.
Dentition, history of, 1081.
Diameters of the head at term, 219.
Diarrhœa during pregnancy, 477.
Diet of lying-in women, 441.
Digestion, disturbances of from pregnancy, 157.
Dilatation of the os uteri, 292.
Diseases of the ovum, 541.
  of the fœtus, 854.
  that may occur during pregnancy, 443.
  that may complicate labor, 824.
Disengagement, irregularities in vertex presentations, 324.
Dropsy of the cellular tissue during pregnancy, 500.
  causes of, 500.
  progress and symptoms of, 501.
  terminations of, 501.

Dropsy of the cellular tissue, treatment of, 502.
    of the amnion, 541.
    of the villi of the chorion, 547.
    of the fœtus, 557.
Duct of Gartner, 87.
Ductus arteriosus, 232.
    venosus, 232.
Dysmenorrhœa, membranous, 110.
Dystocia, 604.
    occasioned by the fœtal appendages, 828.
    due to the fœtus, 839.
    from multiple and independent fœtuses, 863.
        adherent fœtuses, 866.

E.

Eclampsia, 788.
    during pregnancy, 505.
    frequency of, 790.
    time of occurrence, 791.
    causes, predisposing, 792.
        determining, 793.
    symptoms, 796.
    precursory phenomena, 796.
    phenomena of the attack, 797.
    stages of the attack, 798.
    effect of, upon the alimentary canal, 798.
        respiration. 799.
        larynx, 799.
        pharynx, 799.
        heart, 799.
        secretion of urine, 799.
        pulse, 799.
        sensorial and intellectual functions, 799.
        contractility of the uterus, 800.
    phenomena of the cessation of the attack, 800.
    duration of the attack, 800.
    number of the paroxysms, 801.
    interval of the paroxysms, 801.
    comatose state of, 801.
    termination of, 802.
    effect on the memory and intellectual faculties, 802.
        vision and hearing, 802,
    mode of producing death, 802.
    diagnosis of, 804.
        from hysteria, 804.
            epilepsy, 804.
            tetanus, 805.
            apoplexy, 805.
            concussion of the brain, 805.
            intoxication, 805.
    prognosis, 805.
        in nervous subjects, 806.
        in cases of alteration of the blood, 806.
Eclampsia, prognosis, in cases of irritation of organs, 806.
        in different stages of labor, 807.
        after delivery, 807.
        as regards the child, 807.
    pathological anatomy of, 808.
    nature of, 810.
    connection of, with albuminuria, 810.
    treatment, preventive, 812.
            venesection, 812.
            diuretics, 813.
            tartar emetic, 813.
            induction of premature labor, 813.
            chloroform, 814.
        curative, 814.
            blood-letting, 814.
            emetics, 816,
            purgatives, 816.
            catheterism, 817.
            revulsives, 817.
            Junod's cups, 817.
            aspersions, 817.
            antispasmodics, 818.
            opiates, 819.
            premature labor, 820.
            mode of protecting the tongue, 819.
            during gestation, 820.
            during labor, 821.
            after delivery, 824.
Electricity, use of, for induction of premature labor, 1008.
Embryonic spot, the, 183.
Embryotomy, 1040.
    forceps, Baudelocque's, 1045.
        Simpson's, 1054.
Emphysema, pulmonary and subcutaneous, during labor, 827.
    of the fœtus, 859.
Enchondroma of the pelvis, 676.
Epichorion of Chaussier, 168.
Epilepsy during pregnancy, 455.
Ergot, natural history of, 907.
    therapeutical action of, 908.
Evolution, spontaneous, 368.
Exhaustion during labor, 826.
Exostosis of the pelvis, 675.
External genital parts, excessive resistance of, 677.
    obstruction of, during labor from cicatrices, 681.

F.

Face presentations, 335.
    frequency of, 335.
    causes of, 335.

Face presentations, diagnosis, 336.
mechanism, 338.
in mento-posterior positions, 343.
inclined or irregular, 345, 844.
mento-posterior positions, treatment, 846.
Facial nerve, paralysis of, from use of forceps, 994.
Fallopian tubes, 85.
structure of, 85.
anomalies of, 86
obliteration of, as a cause of extra uterine pregnancy, 598.
tumors of the, 725.
False kidneys, 212.
labor, 39.
waters, 546.
Fecundation, where effected, 120.
causes of, 123.
period of occurrence, 123.
Fevers, eruptive, during pregnancy, 446.
of the fœtus, 556.
Fœtal appendages, 187.
monstrosities, 862.
Fœtus, the, 210.
dimensions and weight of, at different periods of intra-uterine life, 211.
position and attitude of, 222.
functions of, 225.
nutrition of, 229.
respiration of, 229
circulation of, 231.
changes in the circulation of, after birth, 233.
innervation of, 236.
secretions of, 236.
active movements of, as a sign of pregnancy, 251.
inflammation of the organs of, 556.
fevers of, 556.
icterus of, 556.
syphilis of, 556.
dropsies of, 556.
spontaneous fractures of, 556.
amputation of the limbs of, 556.
death of, 558.
effect of eclampsia upon, 807.
unusual size of, 839.
diseases of, 556, 854.
hydrocephalus of, 854.
hydrothorax of, 858.
retention of urine of, 858.
emphysema of, 859.
tumors, various, of, 860.
anchylosis of articulations of, 862.
spontaneous fractures of, 557.
death of, in preceding pregnancies, an indication for induction of premature labor, 1007.
section of the neck and body of, 1058
cases requiring, 1058.
operation, 1059.
Fœtus, decapitation of, instruments for 1060.
Baudelocque's, 1060.
Ramsbotham's, 1060.
Van der Ecken's, 1060.
Tarnier's, 1060.
Pajot's, 1060.
Jacquemier's, 1060.
delivery of, by amputation of arm and perforation of the abdomen, 1061.
delivery of, by section of the body of, 1061.
Fœtuses, multiple and independent, dystocia from, 863.
adherent, dystocia from, 866.
Fontanelles and sutures, 218.
ossa Wormiana in, 839.
Foramen of Botal, 212, 231.
Forceps, the, 959.
history of, 959.
Chamberlen's, 960.
Levret's, 960.
Smellie's, 960.
Tarsitani's, 960.
leniceps, 963.
Lyonese, 962.
Baumer's, 963.
Leake's, 963.
Thenance's, 962.
Simpson's, 964.
various modes of articulating, 962.
apparatus for steady traction of,
Chassagny's, 963.
Joulin's, 963.
use of, preliminary precautions, 964.
general rules of application, 966.
application on pelvic extremity, 965.
method of applying, Hatin's, 966.
Baudelocque's, 967.
Velpeau's, 967.
Mad. Lachapelle's, 967.
German accoucheurs, 968.
mode of locking, 969.
making traction, 970.
special rules of application, 971.
application in vertex presentations, with the head at the inferior strait, 971.
application in occipito-anterior positions, 971.
occipito-posterior positions, 972, 994.
left anterior occipito-iliac position, 973.
right posterior occipito-iliac position, 973.
rotation of the head in, 974.

Forceps, application in right anterior occipito-iliac position, 975.
left posterior occipito-iliac position, 975.
left transverse occipito-iliac position, 975.
vertex presentations, with the head merely engaged at the superior strait, 977.
vertex positions, with the head movable above the superior strait, 978.
ace positions, 980.
above the superior strait, 983.
mento-posterior positions, 846, 981.
when the head remains after the body is expelled, 983.
general considerations on the use of, 985.
use of, in inclined vertex or face positions, 985.
contracted pelves, 986.
comparison with version in contracted pelves, 988.
when applicable in case of accident during labor, 991.
use of, for resistance of perineal muscles, 991.
a short cord, 992.
at what period of labor applicable, 992.
statistics and general view of the operation, 993.
effect of pressure of, on the child's head, 994.
in producing facial paralysis, 994.
embryotomy, Baudelocque's, 1045.
Simpson's, 1054.
saw, Van Huevel's, 1055.
Forcible delivery, post-mortem, 1039.
Fossa navicularis, 63.
Fourchette, the, 58.
Frænum linguæ, section of, 1073.
Fractures, spontaneous, of the fœtus, 557.
Fracture of the sternum during labor, 828.

G

Gartner, duct of, 87.
Galactorrhœa, 1090.
Generation, external organs of, 57.
internal organs of, 68.
Germinal vesicle, 92.
spot, 92.
disappearance of, 180.
Giddiness during pregnancy, 505.
Glairy discharges, 293.
Gland, vulvo-vaginal, 64.
Glands of the vulva, 64.
Glycosuria, physiological, 438.
Graafian vesicles, 89.

H.

Head of fœtus at term, 217.
diameters of, 219.
circumference of, 220.
child, unusual size of, during labor, 839.
Heart, hypertrophy of, from pregnancy, 160.
fœtal, sound of, as a sign of pregnancy, 253.
chronic diseases of, during labor, 825.
Hematemesis during labor, 824.
Hemicrania during pregnancy, 507.
Hemiplegia during pregnancy, 509.
Hemorrhage during pregnancy, 486.
puerperal, 747
unavoidable, 755.
uterine, from shortness of the cord, 762.
sudden contraction of the uterus, 762.
general symptoms of, 763.
local symptoms of, 763.
external, 763.
internal, 764.
diagnosis, 765.
from abnormal insertion of the placenta, signs of, 766, 767.
from rupture of the umbilical cord, 768.
external and internal; prognosis, 770.
blindness, deafness, and cephalalgia from, 771.
effect of, upon the fœtus, 772.
from abnormal insertion of the placenta, prognosis, 773.
treatment, 775.
general, 776.
special, 776.
moderate, occurring in the last three months, 776.
profuse, in the last three months, 777.
internal, 782.
moderate, during labor, 783.
profuse, during labor, 783.

Hemorrhage, uterine, from abnormal insertion of the placenta, treatment, 785.
    synoptical table of treatment, 787.
    attendant upon delivery of the placenta, 884.
        causes, 884.
        symptoms, 885.
        diagnosis, 887.
        prognosis, 888.
        treatment, preventive, 888.
        treatment, curative, 889.
        tampon for, 891.
        compression of the aorta for, 892.
        ergot for, 894.
        opium for, 894.
        transfusion for, 895.
    secondary, 898.
    from the umbilical cord, 901.
Hemorrhoids during pregnancy, 487.
Hemoptysis during labor, 824.
Hepatic portal vein, 189.
Hernia, congenital, 207.
    of the womb, 719.
    intestinal or omental, 728.
    vulvar or perineal, 728.
    vesical or cystocele, 729.
    during labor, 825.
Hour-glass contraction of the womb, 871.
Hydatiform mole, 547.
Hydræmia during pregnancy, 479.
Hydrocephalus, 854.
    diagnosis of, 855.
    treatment of, 857.
Hydrorrhœa, 545.
Hydrothorax of fœtus, 858.
Hygiene of children from birth until weaning, 1062.
Hymen, 62.
    persistence of the, 681.
Hysterotomy, vaginal, for spasm of the cervix uteri, 700.

I.

Icterus during pregnancy, 449.
    as a cause of abortion, 449.
    of the fœtus, 556.
Ilium, 39.
Induration, with hypertrophy of the neck of the uterus, 711.
Inertia, secondary, of the womb, 898.
    of the uterus, 868.
Infantile hygiene, 1062.
Inguinal pains during pregnancy, 520.
Innominatum, 87.
Insanity during pregnancy, 510.
Insanity, puerperal, 512.
Intestinal irritation as a cause of eclampsia, 795.
Intra-uterine dilator, 1016.
Inversion of the uterus, 902
Iodine, effect of the administration of, on the development of the child, 914.
Ischium, 39.
Itching of the skin during pregnancy, 512.

J.

Jaundice as a cause of abortion, 449.
    during pregnancy, 449.
    of the fœtus, 556.
Junod's apparatus, 817.
    use of, in eclampsia, 817.

K.

Kidneys, false, 212.
Kyesteine, 161.

L.

Labia majora, 58.
    minora, 59.
    adhesions of the, 681.
    externa, œdema of, 686.
Labor, 275.
    causes of, at term, 276.
        efficient, 276.
        determining, 280.
    physiological phenomena of, 284.
    precursory signs of, 284
    first stage of, 286.
    second stage of, 287.
    pain or contraction, 288.
        cause of, 290.
    state of the pulse during, 291.
    duration of, 297.
    prognosis of, 298.
    effect of, on the mother and child, 300.
    mechanical phenomena of, 304.
    in general. Review of the mechanism of, 371.
    table of the six stages of, in all the presentations, 373.
    twin, 375.
    premature, 377.
    retarded, 379.
    attentions to the woman during, 388.
    retrocession of, 390.
    false, 390.
    regimen of women during, 398.
    signs of the life or death of the child during, 399.
    preternatural and painful, 604.
    extreme slowness of, 605.
    tedious, 607.
    pains, slowness or feebleness of, 607.
        relaxation or suspension of, 607.

Labor pains, irregularity of, 611.
  too rapid, 613.
    treatment of, 616.
  effect of, upon the mother, 615.
    child, 615.
  with pelvis contracted to 3¾ inches in its smallest diameter, 669.
    measuring 3¾ inches at the most and 2½ inches at the least in its smallest diameter, 671.
  with the dimensions of the pelvis under 2½ inches, 673.
  hemoptysis during, 824.
  hematemesis during, 824.
  aneurism during, 825.
  diseases of the heart during, 825.
  asthma during, 825.
  hernia during, 825.
  syncope during, 826.
  exhaustion during, 826.
  emphysema during, 827.
  hemorrhage during, 783.
  fracture of the sternum during, 828.
  irregular or complicated presentations and positions during, 841.
  anomalies in the mechanism of, 841.
  unusual size of the head during, 839.
    of the shoulders during, 839.
  premature, induction of, 1000.
Lactation, 1062.
  duration of, 1064.
  glycosuria during, 438.
Lead-poisoning as a cause of abortion, 453.
Leucorrhœa during pregnancy, 518.
Ligament, pubic, 40.
  sacro-sciatic, 41.
  sacro-iliac, 41.
  sacro-coccygeal, 43.
  sacro-vertebral, 44.
  ilio-lumbar, 44.
Lipothymia during pregnancy, 505.
Liver, fatty condition of, during pregnancy, 157.
  enlarged, of fœtus, with dropsy of the amnion, 544.
Lochia, 431.
  characters of, 431.
  duration of, 431.
  absence of, 431.
  effect of lactation upon, 433.
  profuse or purulent, 435.
  substituted by hematemesis, 433.
  long continued, 433.
  suppression of, 435.
Lying-in, phenomena of the, 421.

M.

Malformations of the vulva and vagina, 681.
Mammary gland, 116.
Mammæ, changes in, as a sign of pregnancy, 241.
Measles during pregnancy, 448.
  congenital, 448.
Meconium, 237.
  discharge of, during labor, 400.
Membrana media, 190.
Membrane, utero-epichorial, 203.
Membranes, rupture of, 295.
    time of occurrence, 296.
    in natural labor, 396.
  abnormal adhesions of, 879.
  retention of, as a cause of secondary hemorrhage, 899.
  detachment of, for producing abortion, 1024.
  puncture of, for producing abortion, 1025.
Membranous dysmenorrhœa, 110.
Menstruation, 103.
  time of beginning, 104
  precocious, 106.
  duration of, 107.
  quantity of, 107.
  vaginal, 108.
  physical characters of, 109.
  cessation of, 113.
  cause of, 110.
  suppression of, as a sign of pregnancy, 238.
  during pregnancy, 238.
Milk fever, 435.
  time of commencement, 437.
  cause of, 437.
  suppression or prevention of the secretion, 437.
  amount and quality, tests of, 1063.
  properties of, before the milk fever, 1063.
    after the milk fever, 1063.
  microscopic characters of, 1063.
  individual differences in, 1064.
  induced secretion of, 1064.
  variation in the quantity of, 1065.
  effect of the health of the nurse upon, 1065.
    of moral emotions upon, 1066.
    of menstruation upon, 1067.
    of pregnancy upon, 1068.
    of sexual intercourse upon, 1068.
    of alimentary and medicinal substances upon, 1068.
  absence or small amount of, 1089.
  profuse secretion of, 1090.
  altered quality of, 1091.
  poor, effects of, 1091.
  over-rich, effects of, 1091.
  quality of, dependent upon the time of its secretion, 1091.
  altered by colostrum, 1092.
    effects of, 1092.
  altered by pus, 1092.
    effects of, 1092.
Mole, hydatiform, 547.

Mole, fleshy, 578.
Mons veneris, 58.
Monstrosity by inclusion, 274.
Monstrosities, fœtal, 862.
Motions of the child productive of pain, 523.
  when first observable, 251.
  characters of, 251.
  simulated, 251.
  mode of detecting, 251.
  mode of exciting, 251.
Myrtiform caruncles, 63.

N.

Neck of gravid uterus, 180.
  softening of, 180.
  volume of, 181.
  form of, 183.
  situation and direction of, 135.
  shortening of, 132.
  posterior obliquity of, 135.
Nervous disorders, induction of premature labor for, 1006.
Neuralgia during pregnancy, 507.
Nipple, structure of the, 116.
  supplementary, 115.
  changes in, from pregnancy, 155.
  too short, 1070.
    mode of remedying, 1070, 1083.
  over-sensitive, remedy for, 1071.
  shields, 1070.
  affections of the, 1084.
    preventive measures, 1086.
    treatment, 1087.
  artificial, 1088.
Nuck, canal of, 84.
Nurses, selection of, 1095.
  examination of, 1096.
  temperament of, 1097.
  age of, 1097.
  pregnancy of, 1098.
  examination of breasts of, 1098.
  examination of milk of, 1098.
  regimen of, 1101.
Nursing, maternal, 1069.
  precautions to be observed, 1070.
  rules of, 1071.
  when to be commenced, 1072.
  obstacles to, 1070.
  children, food for, 1079.
    when to be first given, 1078.
  mother, regimen of, 1082.
  impediments to, 1083.
    from affections of the nipple, 1084.
    from interfering circumstances, 1089.
    from deterioration of the mother's milk, 1090.
Nursing, mixed, 1093.
  by an animal, 1102.
  artificial, 1103.
  by wet-nurses, 1095.
    regulation of, 1100.
Nymphæ, 59.

O.

Obliteration of the neck of the uterus, 697.
Obliquities, uterine, during pregnancy, 541.
Obliquity of the uterine orifice, 702.
  uterine, as a cause of dystocia, 713.
  anterior, as a cause of dystocia, 718.
Obturator membrane, 44.
  foramen, 37.
Odontalgia during pregnancy, 507.
Œdema of the labia externa, 686.
  of the entire soft parts of the pelvis, 686.
Omphalo-mesenteric vein, 189.
  artery, 189.
Organs of connection, 194.
Ossa Wormiana in the fontanelles, 839.
Osteophytes of the cranial bones, 166.
Osteosteatoma of the pelvis, 676.
Osteosarcoma of the pelvis, 676.
Os uteri, dilatation of, 292.
  difficulty of reaching during labor, 293.
Ovaries, the, 86.
  ligaments of, 86.
  situation of, 86.
  size of, 87.
  vesicles of, 88.
  nerves of, 88.
  structure of, 88.
Ovary, tumors of the, 723.
Ovarian vesicles, 89, 90.
  number of, 89.
  structure of, 90.
  modifications undergone by, 93.
Ovula Nabothi, 77.
Ovulation and menstruation, 93.
Ovule, the, 90.
  size of, 91.
  changes of, after fecundation, 179.
    in the tube, 180.
    from arrival in the womb until after the development of the allantoid, 182.
Ovum, diseases of the, 541

P.

Padjeras, 111.
Palpation of the abdomen, 247.
Paralysis during pregnancy, 507.
  facial, during pregnancy, 509.
    from the use of the forceps, 994.
Paraplegia during pregnancy, 509.

Pelvis, 33.
- articulations of, 39.
- in general, 44.
- external surface, 44.
- internal surface, 55.
- greater, 44.
- lesser, 45.
- inclined planes of, 47.
- superior strait of, 47.
  - inclination of plane of, 47.
  - diameters of, 48.
- inferior strait of, 49.
  - inclination of plane of, 50.
- diameters of inferior strait, 51.
- excavation, or cavity of, 51.
- diameters of cavity of, 52.
- general axis of, 52.
- base of, 53.
- differences of, according to sex, age, and race, 53, 54.
- uses of, 54.
- covered by soft parts, 54.
- deformities of the, 616.
- deformed by excess of amplitude, 617.
  - contraction, 618.
- simple contracted, 619.
- contracted by curvature and malformation of the bones, 620.
- oblique contraction of, 623.
- deformed, variations in the depth of, 625.
  - by absolute narrowness, 626.
  - by rachitis, 626.
  - by osteomalacia, 629.
- oblique-oval, 630.
- malformation of, dependent upon previous deformity of another part of the skeleton, 634.
  - dependent upon congenital luxation of the femur, 535.
    - upon non-congenital luxation of the femur, 640.
      - lesions of the inferior extremities, 640.
- deformities of, influence of, upon pregnancy and parturition, 641.
- having at least 3¾ inches in its contracted part, 644.
  - 2½ inches in its contracted part, 646.
  - less than 2½ inches in its contracted part, 646.
- deformities of, diagnosis, 649.
  - sensible signs of, 653.
  - indications presented by, 668.
- exostosis of, 675.

Pelvis, enchondroma of, 676.
- osteosteatoma of, 676.
- osteosarcoma of, 676.
- bony tumors of, caused by fractures, 676.
- inclined positions of the, 844.

Pelvic presentation, 347.
  - frequency, 348.
  - causes, 349.
  - mechanism, 351.
  - prognosis, 357.
    - as regards the mother, 357.
    - as regards the child, 359.
- articulations, relaxations of, during pregnancy, 514.
  - after delivery, 515.
  - prognosis, 515.
  - treatment, 516.
  - inflammation of, 516.
- deformities, causes and mode of production, 625.

Pelvimeters, 654.
- Baudelocque's, 654.
- Coutouly's, 656.
- Mad. Boivin's, 656.
- Stein's, 656.
- Wellenbergh's, 657.
- Van Huevel's, 657.
- the finger as a, 663.

Perforator, Blot's, 1041.
- Smellie's, 1041.
- Kilian's, 1043.

Perineum, 67.
- extent of, 56.
- resistance of, during labor, 678
- laceration of, 680.

Phthisis during pregnancy, 453.

Pica, or malacia, during pregnancy, 464.

Pigmentary deposits, 167.
- spots, during pregnancy, 518.

Pityriasis during pregnancy, 518.

Placenta, the, 194.
- structure, 196.
- arteries of, 198.
- veins of, 199.
- point of insertion, 206.
- battledoor, 210.
- natural delivery of the, 381.
- lesions of the villi of, 549.
  - treatment, 552.
- fibrous obliteration of the villi of, 550.
- induration of, 550.
- encephaloid of, 550.
- cancerous, 550.
- tuberculous, 550.
- fatty, 550.
- fibrinous, 550.
- effusions of blood in, 552.
- apoplexy of, 554.
- delivery of, in cases of abortion, 575.
- retention of, in cases of abortion, 577.

- **Placenta**, absorption of, in cases of abortion, 578.
  - large, coincident with dropsy of the amnion, 544.
  - insertion of, on the lower segment of the uterus, 754.
  - prævia, 755.
  - perforation of, by the child's head, 774.
  - expulsion of, in advance of the child. 774.
  - artificial delivery of the, 868.
  - difficult delivery of, 868.
  - excessive volume of, 869.
  - encystment of, 872.
  - encasement of, 872.
  - abnormal adhesions of, 875.
    - causes, 875.
    - diagnosis, 876.
    - treatment, 877.
  - retention of, 879.
    - treatment, 883.
  - putrid absorption of, 880.
  - late expulsion of, 881.
  - complete absorption of, 882.
  - accidents that may complicate its delivery, 884.
  - hemorrhage attendant upon its delivery, 884.
- **Placental** murmur, 258.
  - apoplexy, 554, 765.
- **Plethora** during pregnancy, 479.
- **Pneumonia** during pregnancy, 448.
- **Polar** globules, appearance of, 180.
- **Polypi**, uterine, as a cause of secondary hemorrhage, 900.
- **Positions** and attitude of the fœtus, 222.
- **Pregnancy**, 118.
  - varieties of, 118.
  - diagnosis of, 237.
  - rational signs of, 237.
  - sensible signs of, 242.
  - signs of, at various periods, 266.
  - pathology of, 443.
  - diseases which may occur during, 443.
  - epidemic diseases during, 443.
  - influenza during, 443.
  - cholera during, 444.
  - endemic diseases during, 445.
  - intermittent fever during, 445.
  - variola during, 446.
  - eruptive fevers during, 446.
  - scarlatina during, 447.
  - measles during, 448.
  - sporadic diseases during, 448.
  - typhoid fever during, 448.
  - pneumonia during, 448.
  - inflammatory diseases during, 449.
  - icterus during, 449.
  - syphilis during, 451.
  - lead-poisoning during, 453.
  - phthisis during, 453.
  - hysteria during, 455.
- **Pregnancy**, epilepsy during, 455.
  - chlorosis during, 455.
  - surgical diseases during, 455.
  - tumors in the abdomen and pelvis during, 456.
  - hypertrophy of the thyroid gland during, 457.
  - ulceration of the neck of the uterus during, 457.
  - diseases of, 461.
  - lesions of digestion during, 463.
  - pica, or malacia, during, 464.
  - pyrosis during, 464.
  - vomiting during, 465.
  - constipation during, 477.
  - diarrhœa during, 477.
  - lesions of respiration during, 478.
    - circulation during, 479.
  - plethora during, 479.
  - hydræmia during, 479.
  - hemorrhage during, 486.
  - varicose veins during, 487
  - hemorrhoids during, 487.
  - lesions of the secretions and excretions during, 488.
  - ptyalism during, 488.
  - excretion of urine during, 489.
  - albuminuria during, 490.
  - uræmia during, 490.
  - dropsy of the cellular tissue during, 500.
  - ascites during, 502.
  - lesions of innervation during, 505.
  - eclampsia during, 505.
  - vertigo during, 505.
  - giddiness during, 505.
  - lipothymia during, 505.
  - syncope during, 505.
  - neuralgia during, 507.
  - odontalgia during, 507.
  - paralysis during, 507.
  - intellectual disorders during, 510.
  - insanity during, 510.
  - diseases of the skin during, 512.
  - lesions of the pelvic articulations during, 514.
  - diseases of the vulva and vagina during, 517.
  - pruritus of the vulva during, 517.
  - leucorrhœa during, 518.
  - vegetations on the external parts during, 519.
  - abdominal, lumbar, and inguinal pains during, 520.
  - rheumatism of the uterus during, 524.
  - displacements of the uterus during, 528.
  - extra-uterine, 585.

Pregnancy, abdominal, 586.
- internal ovarian, 586.
- peritoneal, 587.
- tubo-abdominal, 588.
- tubal, 589.
- interstitial tubo-uterine, 589.
- utero-tubal, 589.
- extra-uterine, pathological changes in, 591.
- extra-uterine, pathological changes in the product of conception, 591.
- extra-uterine, pathological changes in the tissues of the mother, 593.
- extra-uterine, symptoms and diagnosis, 594.
  - progress and termination, 596.
  - rupture of the cyst, 596.
  - prolonged retention of the cyst in, 597.
  - causes of, 598.
  - treatment of, 601.

Premature labor, 377.
- treatment of, 379.
- induction of, 1000.
  - history of, 1000.
  - cases requiring, 1002.
  - contra-indications, 1004.
  - contra-indications on account of abdominal tumors, 1006.
  - contra-indications on account of smallness of abdominal cavity, 1006.
  - contra-indications on account of nervous disorders, 1006.
  - contra-indications on account of intercurrent acute diseases, 1007.
  - contra-indications on account of the death of the fœtus in preceding pregnancies, 1007.
  - operations for, 1007.
  - by external stimulation of the body of the uterus, 1008.
  - by stimulation of the os tincæ, 1009.
  - by uterine douches, 1010.
  - by douches of carbonic acid gas, 1011.

Premature labor, induction of, by dilatation of the neck of the womb by prepared sponge, 1011.
- by irritants placed between the walls of the uterus and ovum, 1015.
- by detachment of the membranes, 1015.
- by the spheno-syphon, 1014.
- by the colpeurynter, 1010.
- by the intra-uterine dilator, 1016.
- by electricity, 1008.
- by Hüter's process, 1009.
- by Braun's do., 1010.
- by Meissner's do., 1020.
- by Villeneuve's do., 1021.
- by Schœller's method, 1009.
- by Kiwisch's do., 1010.
- by Scanzoni's do., 1010.
- by Kluge's do., 1011.
- by Lehman's do., 1015.
- by Cohen's do., 1015.
- by Krause's do., 1016.
- by Busch's dilator, 1018.
- by Krause's do., 1014.
- by Schnackenberger's do., 1014.
- by Barnes' do., 1014.
- by Tarnier's do., 1016.
- by puncture of the membranes, 1019.
- appreciation of various methods of accomplishing, 1021.

Premature delivery, 1000.

Presentations and positions, 304.
- classification of, 305.
- complicated, 849.
- and positions irregular or complicated, 841.

Procidentia of the bladder, 726.

Prolapsus uteri, 720.
- during pregnancy, 528.
- of the cord, 828.
  - causes, 829.

- Prolapsus of the cord, signs of, 829.
    - prognosis, 831.
    - treatment, 832.
- Pruritus of the vulva during pregnancy, 517.
- Ptyalism during pregnancy, 488.
- Pubis, 39.
    - articulation of, 40
    - arch of, 49.
    - section of, as a substitute for symphyseotomy, 1030.
- Puerperal condition, the, 421.
    - hemorrhage, 747.
        - causes of, 748.
            - predisposing, 748.
            - determining, 753.
            - special, 754.
    - convulsions, 788.
        - partial, 788.
    - apoplexy, 790.
- Pulse, during labor, 291.
    - after delivery, 422.
    - vaginal, 698.
- Pus, contamination of the milk by, 1092.
- Pyrosis during pregnancy, 464.

Q.

- Quickening, time of, 251.

R.

- Rectum, tumors of the, 725.
- Regimen of women during labor, 398.
- Relaxation of the pelvic articulations, 514.
- Respiration of the child, lesions of, 412.
    - lesions of, during pregnancy, 478.
- Retarded labor, 379.
- Retention of urine after labor, 439.
    - fœtal, 859.
- Reticulated or vitriform body, 187.
- Retroversion of the uterus during pregnancy, 532.
    - diagnosis, 534.
    - treatment, 536.
- Rheumatism of the uterus, 524.
    - influence of, on the progress of gestation, 526.
    - influence of, on labor, 526.
    - influence of, on the puerperal functions, 527.
    - prognosis, 527.
    - treatment, 528.
- Rigidity of the neck of the uterus, 698.
- Rosenmüller, bodies of, 82.
- Rupture of the uterus, 732, 906.
    - causes, 733.
        - predisposing, 733.
        - determining, 734.
        - traumatic, 734.
- Rupture of the uterus, causes, internal, 735.
    - symptoms, 737.
    - prognosis and termination, 739.
    - hemorrhage from, 739.
    - inflammation from, 740.
    - escape and strangulation of intestine from, 740.
    - recovery from, 741.
    - pathological anatomy, 741
    - treatment of, 743.
        - during labor, 743.
        - during latter months of gestation, 745.
    - early, during gestation, 745.
- Rupture of the vagina, 745.

S.

- Sacro-iliac articulations, 41.
- Sacrum, 34.
- Saw forceps, Van Huevel's, 1055.
    - advantages of, 1055.
    - description of, 1055.
    - mode of operating with, 1056.
    - statistics of, 1057.
    - objections to, 1057.
- Scarlatina during pregnancy, 447.
- Sebaceous coat of fœtus, 215.
- Section of the neck and body of the fœtus, 1058.
- Secondary hemorrhage, 898.
    - inertia, 898.
- Shoulders of child, unusual size of, during labor, 889.
- Sigaultian operation, 1025.
- Signs of pregnancy at various periods, table of, 266.
- Smellie's scissors, 1041.
- Souffle of the cord, 257.
- Spasmodic contraction of the neck of the uterus, 699.
- Spasmodic contraction of the neck and internal orifice of the uterus, 700.
- Spermatic fluid, 119.
- Spermatine, 119.
- Spermatorrhœa, 119.
- Spheno-syphon, 1014.
- Spontaneous ovulation, 101.
    - version, 366.
    - evolution, 368.
- Sternum, fracture of, during labor, 828.
- Sublingual tumors in infants, 1074.
- Surgical diseases during pregnancy, 455.
    - operations during pregnancy, 455.
- Sutures and fontanelles, 218.
- Symphysis, sacro-vertebral, 43.
- Symphyseotomy, 1025.
    - history of, 1025.
    - effect of, 1026.
    - indications for, 1027.
    - mode of operating, 1029.
    - subcutaneous, 1030
    - Stoltz's operation, 1030.
- Syncope during pregnancy, 505.
    - labor, 826.

Syphilis during pregnancy, 451.
  transmission of, by the father, 452.
    mother, 452.
  of the fœtus, 556.

T.

Tampon, the, 584, 778, 785, 891, 927.
  use of, for hemorrhage following delivery of the placenta, 891.
Tedious labor, 607.
Therapeutics, 907.
Thrombus of the vulva and vagina, 686.
  causes, 687.
  symptoms, 688.
  diagnosis, 691.
  prognosis, 691.
  treatment, 691.
  of the lips of the cervix uteri, 704, 705.
Thyroid gland, hypertrophy of, during pregnancy, 457.
Tongue-tie, 1073.
Touch, the, 242.
  vaginal, 243.
  anal, 245.
Transfusion, for uterine hemorrhage, 895.
Trunk presentations, 361, 849.
  frequency of, 362.
  causes, 362.
  recurrence, 363.
  diagnosis, 363.
  auscultation in, 364.
  mechanism of, 366.
  spontaneous version in, 366.
  spontaneous evolution in, 368.
  prognosis, 371.
Tumors in the abdomen and pelvis during pregnancy, 456.
  fibrous, of the uterus during pregnancy, 456.
  bony, of the pelvis, 674.
    caused by fractures, 676.
  of the vulva and vagina, 686.
  sanguineous or thrombus, 686.
  various, of external genital parts, 695.
  fungous or cauliflower, of the cervix uteri, 710.
  encysted, of the uterus or vagina, 710.
  sanguineous, of the lips of the neck of the uterus, 705.
  fibrous, of the cervix uteri, 706.
  polypous of the cervix uteri, 706.
  of the body of the uterus, 721.
  fibrous, of the body of the uterus, 721.
  of the ovary, 723
    Fallopian tube, 725.
    rectum, 726.
    bladder, 726.
Tumors, hernial, 728.
  in the cellular tissue of the pelvis, 731.
  various, of the fœtus, 860.
  abdominal, induction of premature labor for, 1006.
  sublingual, in infants, 1074.
Turning, 929.
Twin pregnancy, 269.
    discovered by auscultation, 255.
    causes, 270.
    diagnosis, 270.
  labor, 375.
    table of positions in, 375.
    diagnosis of positions in, 377.
Typhoid fever during pregnancy, 448.

U.

Umbilicus, affections of, by pregnancy, 154.
  changes of, as a sign of pregnancy, 241.
Umbilical arteries, 186, 232.
  vein, 186.
  vesicle, 188.
  cord, 190, 207.
    souffle of the, 257.
    management of, during labor, 401.
    rupture of, or of one of its vessels, 758.
    weakness of, 870.
    shortness of, as a cause of rupture, 761.
      flooding, 762.
    hemorrhage from, 901.
  vessels, abnormal distribution of, as a cause of hemorrhage, 760.
Urachus, 188.
Uræmia during pregnancy, 498.
  nervous disorders caused by, 499.
Urethra, the, 61.
  increased curvature and swelling of, from pregnancy, 153.
Urinæmia, 499.
Urine, changes of, from pregnancy, 160.
  alteration of, as a sign of pregnancy, 242.
  retention of, in lying-in women, 439.
  excretion of, during pregnancy, 489.
  albuminous, mode of testing, 494.
  retention of, from prolapse of the uterus during pregnancy, 531.
      retroversion during pregnancy, 534.
  secretion of, in the fœtus, 237.
  retention of, fœtal, 859.
Urinary calculi, 727.
Uterine souffle, 258.
  pains during pregnancy, 522.
  hemorrhage, external, 763.

- Uterine hemorrhage, internal, 764.
  - seat of, 764.
  - diagnosis of, 769.
- Uterus, the, 71.
  - situation of, 72.
  - size of, 72.
  - altered direction of, 72.
  - weight of, 73.
  - external surface of, 73.
  - body of, 73.
  - neck of, 74
  - internal surface of, 76.
  - cavity of the body of, 76.
    - neck of, 77.
  - structure of, 78.
  - tissue proper of, 78.
  - external membrane of, 78.
  - internal membrane of, 79.
  - structure of internal or mucous membrane of, 80.
    - the glands of the neck of, 81.
  - vessels of, 81.
  - nerves of, 81.
  - development of, 82.
  - broad ligaments of, 82.
  - round ligaments of, 84.
  - vesico-uterine ligaments of, 84.
  - utero-sacral ligaments of, 84.
  - changes in, from pregnancy, 125
    - volume, 125.
    - shape, 125.
    - situation, 126.
    - direction, 127.
    - density, 130.
    - weight, 130.
  - lateral obliquity of, 127.
    - causes, 128.
  - relations of, at term, 128.
  - thickness of parietes at term, 129.
  - changes in the neck of, from pregnancy, 130.
    - texture of, from pregnancy, 136.
    - serous coat, from pregnancy, 136.
    - middle coat, from pregnancy, 137.
    - mucous coat, from pregnancy, 137.
  - development of the muscular structure of, from pregnancy, 137.
  - vascular apparatus of, during pregnancy, 145.
  - lymphatics of, during pregnancy, 147.
  - nerves of, during pregnancy, 147.
  - changes in the properties of, during pregnancy, 148.
  - sensibility of, during pregnancy, 148.
  - irritability of, during pregnancy, 148.
  - contractility of, during pregnancy, 149.
- Uterus, retractility of, during pregnancy, 151.
  - changes in the adjacent parts during pregnancy, 152.
  - atrophy of, after delivery, 423.
  - internal surface of, after delivery, 424.
  - fibrous tumors of, during pregnancy, 456.
  - ulceration of the neck of, during pregnancy, 457.
  - rheumatism of, 524.
  - displacements of, during pregnancy, 528.
  - prolapsus of, during pregnancy, 528.
  - retroversion of, during pregnancy, 532.
  - anteversion of, during pregnancy, 532.
  - lateral obliquities of, during pregnancy, 541.
  - obstacles at the neck of, 696.
  - obliteration of the neck, 697.
  - rigidity of the neck, 698.
  - spasmodic contraction of the neck, 699.
    - of the internal orifice, 700.
  - incision of the neck for spasm, 700.
  - obliquity of the orifice, 702.
  - swelling and elongation of the anterior lip, 703.
  - thrombus of the lips of the cervix, 704.
  - abscess in the lips of the cervix, 704.
  - sanguineous tumors or thrombus of the lips of the cervix, 705.
  - fibrous tumors of the cervix, 706.
  - polypus of the cervix, 709.
  - fungous or cauliflower tumors of the cervix, 710.
  - encysted tumors of, 710.
  - agglutination of the external orifice of, 696.
  - induration with hypertrophy of the cervix of, 711.
  - cancer of the neck of, 711.
  - obstacles to delivery dependent upon the body of, 713.
  - obliquity of, as a cause of dystocia, 713.
  - posterior obliquity of, as a cause of dystocia, 713.
    - symptoms, 717.
    - causes, 717.
    - prognosis, 717.
  - lateral obliquity of, as a cause of dystocia, 718.
    - treatment, 718.
  - hernia of, 719.
  - prolapsus of, 720.
  - tumors of the body of, 721.
  - rupture of, 732, 906.
  - sudden contraction of, as a cause of hemorrhage, 762.

Uterus, excitement of, as a cause of convulsions, 794.
    inertia of, 868.
    irregular or spasmodic contraction of. 870.
    spasmodic contractions of the external orifice, 871.
        of the internal orifice, 871.
    irregular contraction of the body of, 872.
    hour-glass contraction of, 871.
    spasmodic contraction of the entire organ, 874.
    congestion of, as a cause of secondary hemorrhage, 899.
    inversion of, 902.
Utero-epichorial mucous membrane, 203.

V.

Vagina, the, 68.
    structure of, 70.
    bulb of, 70.
    changes in, during pregnancy, 152.
    congestion of, as a sign of pregnancy, 152.
    diseases of, during pregnancy, 517.
    malformations of, 681.
    inversion of, 685.
    tumors of, 686.
    encysted tumors of, 710.
    rupture of, 745.
Vaginal pulse, 153, 693.
    Cæsarean operation, 1038.
Vaginitis, granular, 518.
Varicose veins during pregnancy, 487.
Variola, congenital, 447.
Vectis, or lever, the, 995.
    history of, 995.
    mode of introduction, 995.
    experiments with, on the dead body, 996.
    use of, in vertex presentations, 997.
    use of, in face presentations, 999.
    use of, in mento-posterior positions, 846.
    use of, upon the head after the body has been delivered, 999.
Vegetations on the external organs, 519.
Vein, omphalo-mesenteric, 189.
    hepatic portal, 189.
Version, spontaneous, 866.
Version, 929
    cephalic, 929.
    by external manipulation, 930.
        before labor, 931.
        during labor and before rupture of the membrane, 931.
        contraindications, 932.
        positions of the child in which it ought to be performed, 932.
        preliminary measures, 932.
        mode of performance, 932.
Version by external manipulation, during labor and after rupture of the membranes, 934.
        in breech presentations, 935.
    pelvic, 936.
        precautions to be observed, 937.
        necessary conditions, 938.
        general rules of the operation, 939.
        introduction of the hand, 939.
        evolution of the fœtus, 942.
        use of fillet in, 942.
        extraction of the fœtus, 943.
        management of the cord, 943.
            of the arms, 944.
            of the head, 945.
        difficulties of, 945.
            from smallness of the vulva, 945.
            from resistance of the uterine orifice, 946.
            from insertion of the placenta on the neck of the uterus, 947.
            from forcible contraction of the body of the womb, 947.
            from mobility of the body of the uterus, 949.
            from shortness of the cord, 949.
            from large shoulders, 949.
            from crossing of the arms behind the neck, 949.
            from arrest of the head, 950.
        appreciation of, 952.
            in vertex presentations, 953.
            in face presentations, 954.
            in pelvic presentations, 955.
            with descent of the arms, 957.
Vertex presentation, 314.
        causes of, 314.
        diagnosis, 315.
        mechanism of labor in, 317.
        inclined or irregular, 331.
        prognosis, 331.
    inclined positions of, 841.
Vertigo, during pregnancy, 505.
Vesicle, allantoid, 187.
    umbilical, 188.
Vestibule, the, 61.
Vitelline membrane, 91.
    nucleus, formation of the, 181.
Vitellus, the, 91.
    condensation of the, 180.
    segmentation of the, 181.
Vitriform body, the, 187.

Vomiting during pregnancy, 464.
  simple, 465.
  irrepressible, 467.
  during pregnancy, causes, 465.
    progress and duration, 468.
    etiology and pathological anatomy of, 468.
    diagnosis, 468.
    prognosis, 469.
    medical treatment, 470.
    surgical treatment, 474.
Vulva, the, 58.
  glands of, 64.
  and vagina, diseases of, during pregnancy, 517.
  pruritus of, 517.
  smallness and rigidity of, from cicatrices, 681.
  malformations of, 681.
Vulva, tumors of, 686.
  thrombus of, 686.
Vulvo-vaginal gland, 65.

W.

Weaning, period of, 1080.
  mode of accomplishing, 1081.
Wet-nursing, 1095.
  regulation of, 1100.
Wharton's gelatine, 209.
Wolffian bodies, 212.
Womb, hernia of the, 719.
  prolapsus of, 720.
  cancer of the neck of, 711.
  inertia of, 868.
  irregular or spasmodic contraction of, 870.
  hour-glass contraction of, 871.
  inversion of, 902.
  rupture of, 906.

END OF INDEX.

This book is the property of
COOPER MEDICAL COLLEGE,
SAN FRANCISCO, CAL.
and is not to be removed from the Library Room by any person or under any pretext whatever.

0123 Cazeaux, P. 759
C38b Midwifery.
1868

NAME	DATE DUE